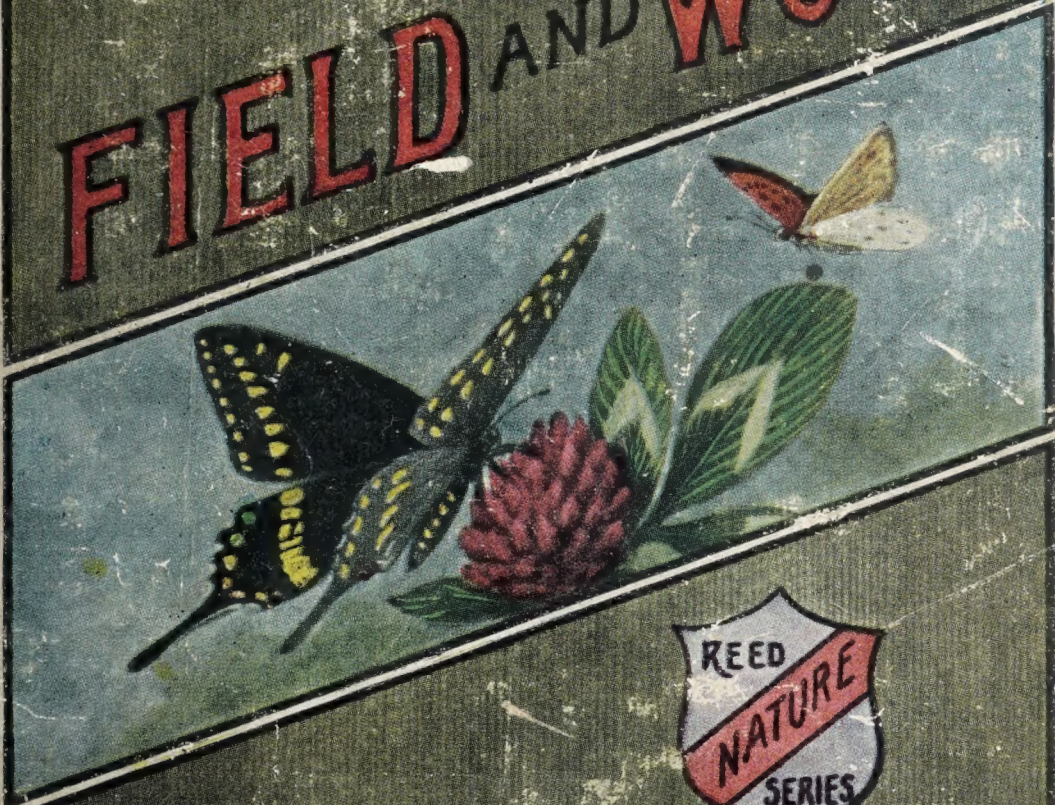


NATURE STUDIES
IN
FIELD AND WOOD



CHESTER A. REED

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To Beatrice

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RED SQUIRREL.

The most active of all squirrels. He scolds loudly if anything displeases him. Also very destructive to the eggs and young of birds.

NATURE STUDIES

— IN —

FIELD AND WOOD

BY

CHESTER A. REED, B. S.

Author of "Land Birds," "Water Birds," "Flower Guide,"
"N. A. Birds' Eggs," "Camera Studies of Wild Birds," etc.

ILLUSTRATIONS BY THE AUTHOR.

1911

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Chas. K. Reed, Worcester, Mass.

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INTRODUCTION

Natural History is a great subject,—a stupendous one. It embraces all out-of-doors. Go where he will, the naturalist will find a wealth of material awaiting him. This book is not in any sense a Natural History,—it is merely an “awakener” to bring to the attention of those who like to ramble in field and wood, the many absorbingly interesting things that await the investigator.

There is nothing that will so develop the senses of perception and the powers of observation as the study of the hosts of animate and inanimate things that abound everywhere. I have often taken country walks with people who certainly must miss more than half the joys of such outings. The song of a Scarlet Tanager directly overhead attracted not a single glance; the angry chipperings of a squirrel were unheard; the beautiful canary-like song of the Indigo Bunting might just as well not have been sung as far as my companion was concerned; even the scare and surprise at the thunderous noise of a Ruffed Grouse that flushed from almost under foot did not interest him enough to notice the nest-full of eggs that she had left.

While such things are not all-important, it would appear to me that a person alive enough to note the common things that were happening about him would be better able to cope with any situation in life that might occur, than one blind to them. I believe every boy and every girl should be educated to know the common birds, flowers, mammals, insects, etc. I think it will not be a very distant day when this recreative-study will be a regular part of every school course, even as it is now in a great many.

TELL-TALE TRACKS.

It is not necessary for the Nature student to forego his pleasures during the winter months, in fact a great many things may be learned at that season that are impossible to discover during the warm months. Snow is a great tell-tale,—it records everything that passes on foot. One accustomed to staying at home, would be surprised at the numbers of creatures that are abroad when the ground is covered with snow.



A Tame Bunny and her Litter.

In a sheltered spot in a wooded hollow where the sun's rays are able to produce quite a degree of heat even on a cold day, we find an old stump. On the white mantle about it are innumerable tiny footprints,—just the merest pairs of dots showing that the creature was exceedingly light in

weight. So it was, for the one or ones that made the tracks were the tiny White-footed Mice that we often find in woods. In a great many places we will find straight dashes between or alongside the foot-prints,—made by the long tails of the little rodents. They live in comfort far down among the roots of the old stump, having plenty of food stored therein to last them through the winter, but they like, when the weather is fine, to come outside and romp about.



Showing the form of rabbit tracks; the wide-spread hind feet in front and the smaller fore-feet prints behind

Even in winter, though, mice are not without enemies,—apt to come upon them at any moment. A sly weasel may scent out their retreat and his lithe, sinuous body enables him to follow them to the innermost recesses of their homes; or a hungry fox, lacking other, larger food, may condescend to dig them out if the stump should prove soft enough.

Among the trails most commonly seen are those of rabbits,—unmistakable footprints, the two fore feet near together then the wider-spread, over-reaching hind ones. I followed a trail for some distance since it happened to be going in my direction. Bunny was loping along at a leisurely gait, the footprints being two to three feet apart. Suddenly the regular groups of prints stopped; an irregular blotch showed that she was sitting up listening. The next group of prints was about eight feet distant and, from then on, they varied from six to ten feet apart. What had alarmed bunny became apparent about two hundred yards farther on; the tracks of a hound came into the rabbit trail at right angles and then followed rapidly along it. I could imagine the deep baying as the hound followed the trail with nose and eyes.

Once around a swamp it led, and then across a large field. Half way across the two animal trails were augmented by two more,—the big footprints of two men. From all appearances, the trail was getting warm and would soon terminate. Sure enough, it did,—at the stone wall bounding the farther side of the field. Here a large pile of stones (pulled from the wall but, as usual, not replaced) showed where bunny had taken refuge from his four-legged pursuer, only to be pulled out by the two-legged ones. From this spot two pairs of shoe prints and one hound-trail led away as the owners went off in search of more game.

Another trail that has interested me is that of foxes. Of course, to follow the trail of a single fox through his wanderings of a day and night would involve a tramp beyond the physical abilities of any man. Still, quite a complete record of the doings of Reynard can be made out of the trails that have come to our notice from time to time. For instance, we may see where he has nosed about the farmer's hen house, hoping to find some way of entrance; we find a spot where he has successfully stalked a grouse or a pheasant, the snow plainly showing where he slyly sneaked up



THE RED FOX

Perhaps the most cunning of all wild mammals. His food consists largely of rabbits, mice and bugs.

behind a stump, and the fatal spring,—only a few feathers testifying of his success; again we judge that he failed because of the lack of these feathers. We may find where he has tried the same tactics, quite often successfully, upon feeding flocks of snowflakes, juncos or sparrows.

We may find where hounds have taken up the chase and, should we care to follow the long trail we may find where he has succeeded in throwing them off his trail by walking

along the top of a wall, or a fencerail or even up the bed of a brook. Less often we may find where the hunter had waited in ambush and laid him low with a broadside of shot when he was least expecting it.

Ah! Here we find the trade-mark, as it is, of another animal crossing the fresh snow,—the trail of a

WEASEL.

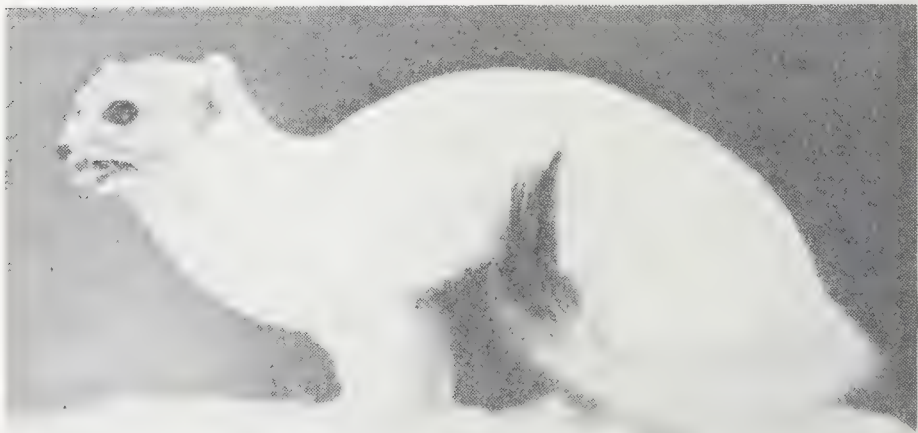
No animal may tread on Winter's mantle without writing its name as plainly before the naturalist as though it were spelled in letters. We follow the pairs of dots, indicating the leisurely lope of a weasel, across the field and along the wall. Presently he stops, even as we do, and closely examines another trade-mark in the form of footprints,—those of a red squirrel, leading from some small trees to the wall. The snow shows plainly where the white animal sniffed at the tracks of the red one and then followed it in through a crevice between the stones. Probably even now, somewhere in the length of the wall the weasel is drinking the life blood of its victim.

We often see weasel tracks in winter and the results of their depredations both in winter and summer, but we very seldom see the animals themselves for they are exceedingly sly. In winter their coats are as white as the snow itself so that even should they show themselves in the open it would be very difficult to see them. In this winter fur, they are known, trapped and sold as ermine. The best and largest ermine or weasel skins are those secured in the most northern countries,—Siberia, Russia, Lapland, Canada and Alaska.

With the exception of a tiny weasel, barely six inches long, found in the northwestern states, every known species has a black tip to the tail. All northern forms change from white in winter to brown in summer, so that they are practically "ground color" all the time.

Rabbits, mice, squirrels, all kinds of birds and poultry

have regular places on the weasel bill of fare. Although small animals requiring comparatively little food, weasels are the most bloodthirsty of all animals; their lust for killing leads them invariably to kill many times what they need. Lithe and powerful,—they can, if necessary, in a few bounds overtake the fleeing rabbit; they are nearly as active in trees, if occasion demands, as are squirrels; they can follow the tortuous course of the tiniest of animals through walls or underground passages; or, and this is the usual manner of hunting, they can stalk their game and spring upon it unawares.



WEASEL IN WINTER DRESS

A little sinuous body that allows it to follow its prey through walls or along underground tunnels.

It is small wonder that the hand of man is ever raised against them, both because of the value of their fur and because of their destructive habits. Cruel as they certain-

ly are, they are not lacking in courage; indeed, I know of no animal that will show as much fight to the last gasp. I have seen several of them killed by dogs but every one of them managed to turn and sink his fangs through the dog's lips. I once "cut" one off from retreat to a stone wall; instead of running, it faced me, with ears flattened, eyes blazing and needle-like teeth exposed. When I attempted to touch it with a stick it launched itself straight at me. They are particularly ferocious in summer when they have a family of little weasels close at hand.

THE AWAKENING—FIRST FLOWERS.

After months of snow-covered ground, what more natural than that one should feel a thrill of satisfaction at seeing the first returning bird or finding the first flower. There is, however, a difference of opinion as to which is the first flower, some claiming one species, some another. Perhaps I should say that this difference of opinion is really confined to the second flower to bloom for it is almost universally conceded that, in the northern half of the United States, the common, lowly Skunk Cabbage first pokes its curious blossom above ground; many, however, refuse to consider this as a flower,—hence the dispute.

A careful search of many records and opinions shows that a large majority favor *Hepatica* which coincides with my experience as I have always found these beautiful blossoms several weeks in advance of anything else except Skunk Cabbage.

Sometimes in January, more often in February and always by March we find these commonly despised flowers in full bloom in marshy meadows. Curious things,—thick, brittle-skinned with a twisted point that seems to have become bent and mis-shapen forcing its way up through the frozen earth; such is the outward appearance, but this is not the real flower,—just a spathe or protector for them. To some it may appear almost sacreligious to mention the beautiful calla lily in the same breath with skunk cabbage, but the two are very closely related, the pure white face of the calla being a spathe just as is the purplish, distorted covering of the present species.

Inside this spathe, we will find the real flowers clustered about a very stout, corrugated spadix. Even though blooming so early in the season, skunk cabbage is largely dependent upon bees and flies for the setting of its seed; the staminate flowers are clustered at the top and the pistillate ones at the bottom of the spadix, the former maturing first requires the services of flies as messengers to carry the

pollen from one plant to another more advanced one in which the lower flowers are developed. Many small, bee-



SKUNK CABBAGE

The thick fleshy blossoms appear and commence to wither before the bright green foliage shows itself.

like flies hibernate under the leaves and awaken at the first warm sun-rays; it is these that are commonly found about the first skunk cabbages. A little later, early in April, many forms of carrion flies and beetles are attracted to them by the offensive odor that pervades the air for yards about them.

Although possessing the same mal-odorous properties, the handsome, large light green leaves that follow the flowers are, nevertheless an attractive addition to the appearances of marshes and brook-sides.

When we seek the second flower on our list we must hie away to some dry wooded hillside. Early in March, in New England, we may find them smiling at us from among the dead leaves or it may be that we must first brush the snow aside to get a glimpse of them, for they often bloom under the snow. It is so long a time since we have seen real, wild flowers that we must stop to admire them, no matter what our errand or how great our hurry. As though to recompense us for the ugliness of the skunk cabbage, this second arrival is one of the fairest and most beautiful flowers that we have.

Hepatica is one of the few plants producing flowers of differing shades. On one plant the flowers may be pale blue, on another pink and on a third pure white; they vary, too, in size, some spreading twice as wide as others. Leaves of the previous year, of a dull reddish hue, are on the plant during the flowering season; new bright green ones appear after the blossoms have passed away.

Following closely on the heels of *hepatica* come the fuzzy pussy-willows and the far-famed *arbutus* which, unfortunately, is being gathered much more freely than its natural increase warrants. It has already become very scarce in the neighborhood of large cities. I hope that all readers who gather these beautiful, fragrant blossoms will avoid disturbing the roots at least. The flowers following *hepatica* come in such profusion and the order varies so greatly in a slight change of locality that a single such list is available only in the spot that it was made.



AWAKENING FERNS

The tightly coiled fronds are entirely swathed in brown wool. This wool is used by a great many birds for nesting material, the interior of that of the humming bird being almost entirely composed of this substance.

THE BUMBLEBEE.

Many flies and small bees make their appearance earlier in the year than the large bumblebee (*Bombus*); a few warm days in succession, however, will bring *Bombus* bumbling around in search of pollen and honey. We will look into the life history of *Bombus* just a bit, because we will see her at work or see results of her labor wherever we go in wood or field, and because she is one of the most useful of insects.

New colonies of bumblebees have to be produced each year, for upon the approach of winter the workers and the drones die, leaving only some of the females which hide away and remain in a comatose state during cold weather. Immediately upon emerging from her winter retreat, *Bombus* visits such pollen-bearing flowers as are open and allays her hunger, then she looks up a suitable place for a nest, on the ground in the grass or perhaps under the edge of a stone.

Wax cells are built, one at a time, until the little hive contains a dozen or more. Each cell is filled with a mixture of honey and pollen as food for the larvae that will hatch from the egg she deposits in each,—then the cell is sealed. The first family is composed wholly, or chiefly, of workers; they build more cells in which the original queen lays eggs, and the larvae are fed and cared for by the workers. This second crop of bees usually appearing early in August, is composed of females and drones (males).

The social life practically terminates at this time, the nest being deserted and its occupants going in all directions, mingling with those of other colonies. Therefore it is seen that the social life is not nearly as complete as with the well known honey-bees and the colonies are never nearly as large.



JACK-IN-THE-PULPIT.

Common in swamps or other moist places. The slippery interior often proves a fatal trap to insects that enter for food or shelter.

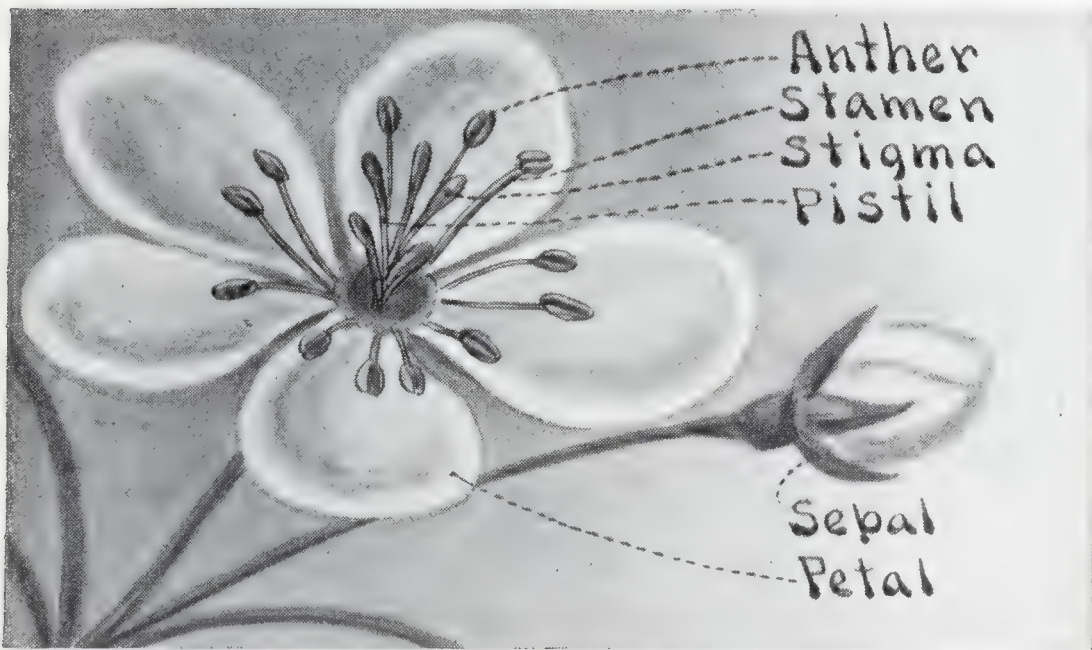


MOUNTAIN LAUREL.

Locally abundant in woods. Each stamen is sprung into a pocket and upon its release spreads pollen about.

VALUE OF BEES.

Bees may safely be reckoned as one of our nation's most valuable assets. It is not the honey they produce that is their chief value, but the fact that they are necessary and useful for the reproduction of a very great many of our plants. This is very commonly known but is so interesting that it will bear repetition. Before mentioning some of the cases in which the visits of bees are necessary to flowers it will be quite necessary to say something about the manners (also well known) in which so-called specialized flowers are fertilized.



PEAR BLOSSOM

Showing the parts of a perfect flower.

I have taken as an illustration of a perfect flower, a pear blossom. Notice particularly the stamens and pistil; the

former are tipped with anthers containing pollen grains, the latter has at the top a sticky stigma from which a very slender tube leads to the base containing the ovules. In order to quicken or set the seed, pollen from the anthers must be deposited upon the stigma.

The least highly developed plants fertilize themselves, that is the anthers and stigma are so located that pollen falls directly from one to the other, or the stamens may gradually curve inward when the pollen is ripened so as to place it in contact with the stigma.

A great many of the more highly developed plants have the pistils and stamens so situated that self-fertilization is impossible. In which cases it is necessary that some medium transport the valuable grains from the anthers to their destined places of repose.

The great naturalist Darwin discovered that the introduction of new stock is just as vital to a strong healthy race of plants as it is among animals, and that many plants were so arranged that reproduction could not take place without the introduction of pollen from another blossom and, in some cases, from another plant. Certain flowers are infertile to their own pollen; others have the pollen ripen before the stigma of the same flower is in condition to receive it, still others have only stamens on one blossom and anthers on others, sometimes on the same and sometimes on different plants. These conditions mean that pollen must be carried from flower to flower or plant to plant, and the agency for doing this is principally insects. Certain specialized flowers require the assistance of certain moths, the tongues of which are of just the right length to reach the store of nectar and also accomplish the purpose to the flowers. The big bumblebee, however, is the benefactor of a greater variety of flowers than any other one insect.

Bees, of all kinds, are particularly well adapted by nature for this work. They are comparatively heavy, strong and are steady workers. Butterflies flit aimlessly about, often stopping to rest for hours at a time; they have nobody but themselves to look after so they can dine when

hungry and rest when tired. On the other hand, bees are always bustling about; they have many babies at home to feed and can stop work neither to play nor rest.

Investigation will show, too, that bees are very constant in their work. Although they feed upon many kinds of flowers, they do not mix their foods; if they are visiting clover, they continue to visit it, passing by any other species that may intervene. It seems almost as though they must realize that they should not leave clover pollen at the door of self-heal or any other different species of flower. Not that it would do any damage, for nearly all flowers are infertile to pollen from any other species, but it would be a useless waste of precious pollen.

Bombus finds the latchstring out at many flowers that are permanently closed to most insect visitors. For instance her weight is just sufficient, when hanging on the lower lip of toadflax or "butter-and-eggs" to open its pouting mouth so she can insert her tongue and drain its nectary. Smaller bees and, sometimes, ants finding that the large orange palate blocks access to the honey by legitimate channels, often gnaw through the spur and steal it from without. Another excellent example of a flower closed to plebian insects is that of closed gentian. The five parts of its corolla come together so closely at the top that, try as they will, ant, fly or small bee cannot force it open, but they do sometimes gnaw through the outside. *Bombus*, however, by using the great strength in her legs and her tongue gradually forces the petals apart so she can squeeze her head and perhaps three-quarters of her body inside the tube, from which position she can get at the abundant supply of nectar at the bottom.

Probably the orchids offer the most interesting studies in plant fertilization. Concrete examples of how bees and moths pollenize some of these will be found in another chapter about orchids.

THROUGH FIELD AND MEADOW.

Let us drop our business cares for awhile and hie away to the fields. Perhaps we can find something to while away the time for a few hours. We certainly can:—Show me an acre field dotted with a few thorn bushes and occasional blackberry vines and I will show you material enough to keep a naturalist busy for years.

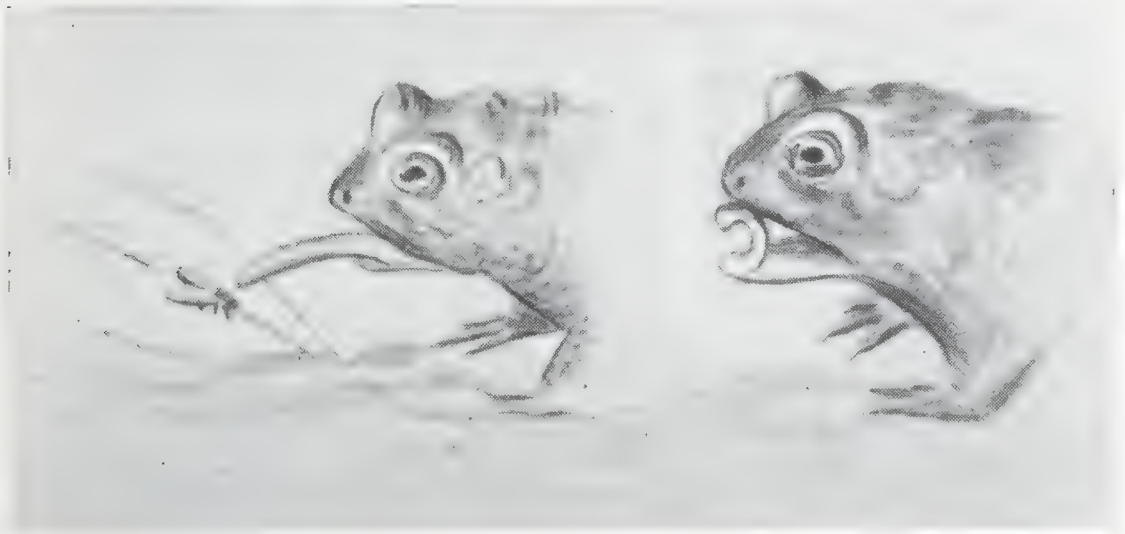
Perhaps the first thing we spy is a toad,—just a plain, every-day, hop-toad. Here is a good study,—where do toads come from, what do they do and where do they go? We will pry a little into the affairs of

THE AMERICAN TOAD (*Bufo americanus*).

We do not even have to go to the fields to study the habits of toads for we can find them on the lawns or in the gardens about houses even in cities. A long-limbed, sleek, brightly-marked frog may be regarded as an object of beauty but a toad cannot be so considered; squat, fat, lazy and covered with a rough, warty skin, they are the very opposite of frogs in comeliness. But, we will not judge them by appearances but by actions; they are insect destroyers of the highest order. While they sleep all winter, they eat quadruple rations all the rest of the year for their digestion is very rapid, requiring that their stomach be completely filled about four times each day. I believe it has been estimated that owing to the nature and quantity of insects captured by toads, that each individual toad is worth to the community the sum of nineteen dollars and eighty-eight cents.

We will watch a toad closely and see what insects he eats and how such an apparently slow creature is able to catch them. The best way to see how his food is taken is to place him on a piazza or in the back yard where flies are fairly abundant. And, slow as the toad appears, you will have to watch very closely. He keeps perfectly still, a fly alights within about two inches of him, his mouth opens,—and the fly is gone. He was too quick for us that

time, for surely the insect did not fly down his throat of its own accord, although it seems as though it must have done so to have disappeared so mysteriously. Another fly stops about six inches ahead of him; he eyes it intently, gives a lazy hop toward it, at the same time opening his mouth,—and again the fly has disappeared apparently without his having touched it. When catching ants or worms, our toad sometimes moves more deliberately so that we can see how his prey is seized.



Showing the attachment of the tongue of the front of the lower lip and the method of capturing insects.

The tongue of a toad is a wonderful organ. Instead of being attached to the back parts of the mouth, it is hinged to the very front and the tip lies near the throat. Like a flash, it can be projected forward for about two inches, the insect aimed at being glued to its sticky tip and instantly carried back into the throat.

Very conclusive and convincing observations of toads have been made at various agricultural experiment stations, notably at Amherst, Mass., where it was found that 88 per cent. of the food consumed by toads was composed of

injurious insects. It was estimated that the insects eaten by each toad would average nearly ten thousand in three months. This vast number includes flies, grasshoppers, crickets, spiders, hard-shelled beetles, caterpillars of all kinds including the destructive tent and tussock-moth species, slugs, earthworms, ants, etc. I doubt if any one species of bird, any one kind of animal or any single variety of insect is as valuable for destroying injurious insects as is the common toad.

Dampness is necessary for a toad's existence; he needs water, not to drink but with which to moisten his skin. Nothing pleases him more than to squat in a shallow puddle and soak for hours at a time. Unless disturbed, he sleeps during a large part of the day but becomes quite active towards evening and remains so as long as there is a ray of light to guide him in his search for food. They often remain all night under the street lights in cities, gathering in all kinds of beetles and moths that come to the ground.

The skin of a toad is rough and "warty"; its color and texture harmonize perfectly with loose soil so that it cannot readily be seen by enemies while it is quiet. These "warts" or excrescences are protective features in other ways too, for they secrete a fluid, disagreeable to the taste, causing many animals and birds, that otherwise, would eat them, to avoid them. Still a great many of them are destroyed, especially by snakes and by skunks.

Toads change their old clothes for new ones at least four times each year. This shedding of the old skin is a very interesting performance, but as it takes but a few minutes to do it and we have no warning as to when it will occur, it is a performance not commonly seen. We may often find dried skins that have been shed by snakes but we never find those of toads for the simple reason that they always swallow their old clothes. When the new skin is fully formed, the old is loosened from it, splits up the back, down the belly and along each leg. By much wriggling and freely using his hands, the skin is freed from his

hind legs and sides and rolled in a ball in front of the chest; it is then with difficulty gulped down and our toad appears in a bright new shining garment, that however rapidly dries and darkens to nearly the same shade as the old one. Toads are perfectly harmless and can be handled freely, in spite of the old superstitions of ill-luck, poisonous and "wart-making" properties ascribed to them.

In winter they hibernate, burrowing several inches under ground and remaining torpid until the warm weather of the following spring awakens them. Immediately upon emerging from their long "sleep", they make for some pond where they sport about in company with many other toads and frogs. At this time they are very happy and their low, musical, crooning trill is heard constantly. The female deposits her eggs in the water in long, continuous strings coiled upon the water plants. They develop more rapidly than those of frogs, the tiny black tadpoles appearing without the jelly mass in four or five days. Within about ten days, their mouths have opened and they are full-fledged "polly-wogs." It is a peculiarity of very young toad-tadpoles that they go about in large compact schools. In less than two months from the time the eggs are laid, the tadpoles have changed into tiny frogs and many have left the pond. They are very small and very dark,—smaller than any of the frogs, and their backs have no sign of the roughness or warts that will appear later. Young toads shed their coats usually a half dozen times before winter; this is necessary because of their rapid growth,—they become too large for their garments and of course must have new ones.

I have said that toads eat many ants, so what more appropriate than that we turn our attention to these ants. Like toads, we find plenty of them right in our yard as well as in the fields.

THE WISE ANTS.

An ant is a tiny, a very tiny creature whose career and that of all his fellows would terminate instantly if the good housewife could have her way. Small as he is, however, if the truth were known I fear we should have to admit that he is the most intelligent, most industrious and most determined living thing in proportion to his size.

The study of ants is not a lofty enterprise for it demands that one literally come down to earth on his hands and knees,—“grovel in the dust” as a certain friend of mine would say. Yet I can assure you that an hour cannot be more pleasantly nor more profitably spent than in watching a single one or a colony of these too-often despised insects. I could name a number of savants who would be benefitted immeasurably by such a study. I am quite sure they would change some of their present views in regard to the question of animal instinct and intelligence. It is a very common failing for biologists or ‘closet naturalists’ to class as instinctive all acts that they cannot explain; in other words, the term “animal instinct” is too often used to shield ignorance.

Ants are subject to moods and passions just as we are: They have their deadly wars with foreign nations of other species; they sometimes, but rarely, have civil wars; they have hunting expeditions, large parties of them banding together to kill other insects and carry them home for food,—for ant-food consists of both animal and vegetable matter; they also have their regular daily domestic duties such as marketing, house-cleaning, milking the cows, etc. Perhaps it will be well to pause and be a little more explicit about these cows, for that is really what they amount to.

It was the naturalist Huber who first made the wonderful discovery that ants regularly visited certain kinds of plant lice or aphids for the purpose of procuring nectar which they got from two tiny tubes on the backs of the aphids. These plant lice are slow-moving, almost helpless mites. They are very numerous and propagate with ex-



A. The fully developed male and female ants have wings in the first stages of their lives.

B. Aphids feed upon the juices of plants, making honey which the ants procure from two tubes located on the back.

C. Ants will carry burdens the weights of which exceed their own, over seemingly impossible obstacles.

treme rapidity, a fact that is quite necessary because they are preyed upon and furnish food for a large number of insects, especially smaller kinds of flies. These latter insects consider the aphids themselves as food, not as sources of food supply, while ants realizing that the lice are more valuable to them alive, than dead, often defend them from other enemies or transport them bodily to other plants where they will be less likely to be attacked and where they can get a good supply of fodder. Each colony of ants has its own herd of these "cows" and attends to them most assiduously for they are regarded as among their most valued possessions.

Not only do ants keep cows but they very frequently have slaves to work for them. Large colonies of warrior ants sometimes make raids upon neighboring cities of other species, defeat them in pitched battles and carry home prisoners of war to work for them. The ant wars are no pink-tea affairs, but are bloody conflicts. They go at one another hammer and tongs, one side fighting for conquest, the other for life. Many a head is nipped cleanly off by a clever antagonist and many a soldier limps homeward after the fray, minus one or more of his six legs.

As is very well known, bees and wasps have their workers and their drones. Ants are even more social and carry class distinction or caste even farther. They have several classes;—drones, workers,—these being undeveloped females, warriors, slaves, etc. The fully developed males and females of most species are equipped with wings which they shed after wearing for a short time.

The tiny, yellowish-white eggs laid by the queen ants, hatch in about two weeks, forming little helpless, white larvae. These larvae are tended and fed by the worker ants, being carried from chamber to chamber as they require more or less warmth. The larvae are fed until they are full grown, taking three or four weeks, and then transform into whitish pupae or cocoons. It is these tiny cocoons that the workers are so busily carrying about when

a colony is disturbed, trying to find places of safety for them.

The load that an ant can carry is astonishing and it is amusing to see how they will overcome almost insurmountable obstacles and arrive safely home with the burden. Just imagine a man weighing one hundred and fifty pounds trying to climb eight foot fences and walls, while carrying as a burden a box three by three by eight feet weighing perhaps two hundred pounds and the comparison will just about balance the work that ants are constantly doing.

The ant family is a very extensive one, comprising over four thousand species, and inhabits every temperate and torrid part of the globe. They live in all sorts of houses,—large mounds, subterranean earthy cells, hollows bored in decayed wood, etc. Some species live almost exclusively in or about houses, these of course being the ones that bring down the wrath of good housekeepers upon all ant heads.

As we have seen, ants are fond of sweet substances, a fact which draws them to the nectar which most flowers offer as a lure to attract insects useful to them. Ants, with their small shining bodies, are of no use for transferring pollen from flower to flower and their pilfering often cheats the flower of its chance of receiving a visit from bee or moth that would prove useful to it. Many plants have apparently grown defenses to avoid visits by crawling insects; these barriers usually take the forms of hairy or sticky stems or tufts of hair in the throats of the flowers. Everyone knows that a sticky surface offers an unpassable obstruction for all crawling insects. If anyone doubts that the tufts of tiny hairs in the throats of flowers or on the stem would bar out an ant, let him just reflect for a moment; remember that those same hairs represent to the ant what a very broad hedge of very closely set, very tall telegraph poles would to a man.

Every animate or inanimate thing in Nature has its enemies and ants are no exception. Predatory insects, animals, birds, plants, the hand or foot of man, disease and

other dangers lurk on every hand. One of the most deadly enemies they have in our country is the Flicker or Golden-winged Woodpecker. One of these birds, under my observation, worked busily over a small ant hill for about fifteen minutes, his head darting back and forth with almost clock-like precision, each plunge being the death knell of an ant or a larvae. When he left, I prodded about with a stick but could not discover a single one of the former residents in the mound.

Among other insects we are sure to meet in the field and also about houses in the country are wasps. There are many species of wasps and as everyone knows they all, or at least the females, sting severely when aroused to anger. Therefore studies of their lives, interesting as they are, must be conducted so as not to form too intimate relations with them. I have sampled the stinging qualities of quite a number of species so that I have little desire to anger them.

WASPS.

Wasps are divided into two classes, solitary and social. The social wasps are quite similar to bees in their habits and dispositions but the so-called solitary ones are very different and exceedingly interesting.

A volume on the habits of the solitary wasps (*Sphecoidæ*) would make one of the most interesting and most readable books that can be imagined. Many species of these solitary wasps are commonly found about country houses so their habits can quite easily be determined.



Mud-Dauber carrying spider to it's cell. When filled, an egg is laid on the last spider and the cell sealed.

Under the eaves of barns and in old attics we usually find domiciles of the mud-daubers belonging to the genus

Sceliphron. A few facts concerning the habits of some living in a certain old house will give a little idea of the characteristics of all solitary wasps.

There were two nests under way, about six feet apart,—one in the very apex of the roof and the other on the side of a beam. They were evidently commenced at about the same time, but there was a vast difference in the methods and workmanship of the two wasps. One was exceedingly nervous, always flirting her wings and working with feverish haste; the other was quiet, painstaking and methodical with the result that her nest was far superior to that of the first in finish even though it answered its purpose no better.

The mud of which the nests were made was brought from the barnyard, a plentiful supply always being available near the old pump. Entrance to the old attic was through a broken corner in one of the window panes.

These nests usually consist of several cells, but one of which is built at a time. The rapid worker had one of her cells shaped before night on the first day; while no measurements were taken I should say that it might have been three-quarters of an inch diameter on the inside and perhaps an inch deep. Early the next morning a spider was found neatly tucked in one corner and, as I watched, the worker came buzzing in through the window carrying another. It was quite a large black spider, weighing fully as much as the wasp but it was carried without much effort, being closely held up against her body by the middle and last pair of legs. This was tucked in beside the first and, a little later, another one was brought, the purpose for which will be seen later. The three spiders completely filled the cell; in about an hour she had it completely sealed over with mud. Without stopping to rest she at once commenced journeying back and forth between the barnyard and the attic carrying material for another cell to be built beside the first. In five days she had four of these little sealed mud nests completed.

The other wasp, the careful worker, only had two of her

cells finished but they were evenly made and smoothed off, making those of her neighbor odious by comparison. The differences were nearly as great and reminded me of the shacks and mansions often seen near together in the southern states. Of course this comparison is hardly a just one for the mansion required capital and the shack did not, while both wasps had the very same material to work with. The only difference seemed to be in the taste, the skill or intelligence of the two individuals.

Now let us look into the spider question. How and why did the wasps get them? I do not know where these particular wasps mentioned above secured their prey but I have seen other of the same species in the act. Most people have an inborn horror of spiders so that it is almost impossible for them to see the good points or beauties of some of them. There are ugly spiders and there are spiders that look ugly but there are also spiders that are pretty. It is one of the pretty field spiders, the black and yellow *Argiope*, that the mud daubers like best.

An *Argiope* spider had its web-trap set near the ground among some cinquefoil vines. When I discovered it, it was repairing a large hole in the web, made by an insect stronger than its silken meshes could restrain. A mud-dauber landed on a leaf near the web apparently to rest herself, for she remained still except for an occasional nervous flirting of the wings common to all wasps and hornets.

Wasps appear to be near-sighted or have poor vision for it seems to be difficult for them to distinguish motionless objects. The spider was quiet for a minute or two after the new arrival, then re-commenced work. The velvety-black and yellow body of the working spider soon attracted the attention of the wasp and she dashed quickly at it. A spider is usually very agile but this one could not avoid the sudden attack. The wasp landed on its back and stung it probably before it was aware of danger. Wasp and spider tumbled to the ground but the only movement shown by the latter was a convulsive twitching of the legs. The wasp sting evidently carries a very powerful anaes-

thetic that stupefies spiders almost instantly. This comatose state lasts for several days, long enough for the purposes of the wasp, at the end of which time the spider dies provided that he is not devoured before.

The wasp clasps its legs about the victim firmly and flies off with it to its cell,—usually provided beforehand as we have seen. When the cell is filled with spiders, the wasp deposits a single egg upon the last one and seals up the house. In a day or two this egg hatches and the little grub starts working on the large store of provender provided for it by its thoughtful parent. It grows rapidly in size and soon consumes all of the spiders at which period it spins a cocoon about itself and becomes a chrysalid. The change to the wasp stage may come in a few weeks or a few months depending upon the season.

Other species of solitary wasps build their cells in holes in the ground, filling them with other kinds of spiders, with caterpillars or even, as one species does exclusively, of harvest flies or cicadas.

We have seen that spiders of many kinds are in demand among the wasp family as food for their babies, but spiders have other aims in life than to be served to wasp-grubs. We will investigate the owners of some of the many webs we see everywhere, in the grass and among the blackberry vines, and see what they do for a living.

WEBS AND THEIR MAKERS.

An early morning walk through the fields discloses numbers of beautiful webs glistening with dew. How dainty and exquisite some of the patterns! What skilful workers spiders must be to produce such designs! Yet spiders are loathed by most persons. Why? Probably because they are not informed as to the value of spiders in the economic world and very greatly over-estimate the dangers from them. True some spiders will sting; so will a dog bite; so will a cat scratch; and so will a man clench his fist in self defence. It is human, animal and insect nature to



COMMON MILKWEED.

The milkweed butterfly is inseparably connected with milkweed. Its juices impart a disagreeable taste to the insects that protects them from birds.



BLUE FLAG; IRIS.

Usually growing in situations where rubber boots are desirable if we wish to gather them.

defend when attacked and we must admire them for it. A spider is never the aggressor in an attack on man.

There are big spiders and little spiders, handsome ones and plain ones, but they are all interesting studies as you will find if you will but cast aside your abhorrence and watch for a while.

One of the prettiest of the spiders and one of the most



When covered with the early morning dew, spiders' webs are very conspicuous and good subjects for the camera.

common in eastern United States, is the Orange (*Argiope aurentium*). This creature also sets one of the most regularly graceful webs for the ensnaring of its insect victims; the silken meshes are very closely stretched about the center, making a firm base on which she often rests while awaiting her prey.

Sooner or later a blundering fly will be caught in its threads or a grasshopper or locust will try to hop through it. Unless the intruder be a bee or a wasp, *Argiope* will immediately rush at it, grasp it in her legs and commence walking over it, meanwhile spinning a strong silken web about it until it is very securely trussed up. This supply



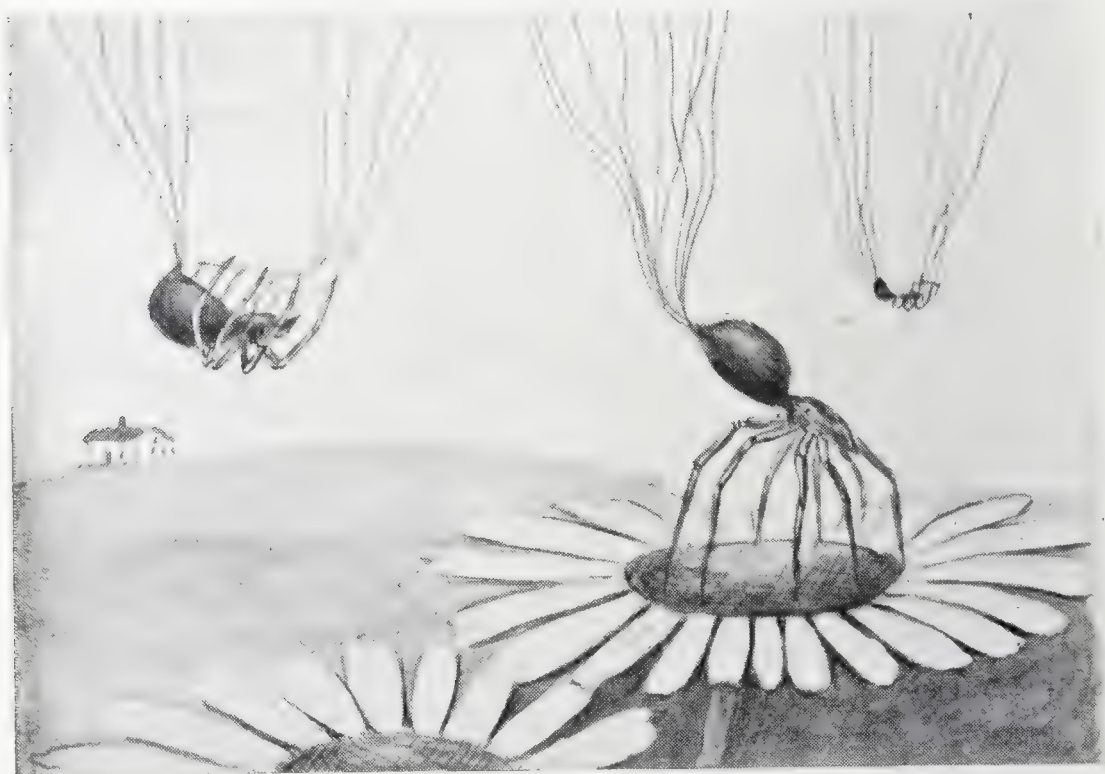
Spiders quickly pounce upon insects that become entangled in their nets. They are swathed in silk and hung up until they are needed for food.

of fresh living food is then swung in to the center of the web where it will be in easy reach when hunger calls. It is but natural to pity the insect that is tied up awaiting the appetite of its captor, but we must remember that it always has been and ever will be the way of the world,—the strong and the cunning live upon the weak and ignorant. Furthermore the insects that spiders capture are almost without exception ones that are injurious to vegetation or public health. Spiders play a very important role in keeping down undue increase of insect life.

The “traps” of these orange and velvety-black spiders are very commonly erected among blackberry vines or among the white chrysanthemums that dot the fields. Each species of spider has its own style of architecture; many kinds set their nets in erect positions like *Argiope* and many others spread theirs horizontally near the ground. The former apparently entangle more insects but the latter offer a safer retreat for the owner which generally lies in wait in a covered, silken tube leading down into the ground. Although spiders prey upon other insects they are in turn preyed upon. Nearly all kinds are regarded by birds as dainty morsels but even greater than the danger from this source is that from many of the solitary wasps which use them as food for their babies as described in the sketch of a mud-dauber.

Spiders, especially the smaller ones, as well as all other animate things have the wanderlust and they construct remarkable vehicles to carry them on their voyages. They are aeronauts of no mean ability. If we closely watch them at the proper time, usually in October, we may see them construct their airship and incidentally see how they spin their silken webs. When a spider’s ambition turns to ballooning it hies away to the top of a fence post, the end of a twig or it may be the top of a golden-rod. Our spider takes a firm hold with its legs, elevates its body at an angle of about forty-five degrees and commences spinning silken threads. The liquid silk comes in five tiny

jets from the spinnarets on the lower part of the abdomen; solidifying on contract with the air, if atmospheric conditions are right these fine threads will float upward. As the silk strands lengthen we can see that the spider is gripping the support for all he is worth to counteract the lifting effect of his filmy balloon. When the threads have attained a length of from six to twenty feet if he thinks the pull is sufficient, the little aeronaut springs upward,



BALLOONING SPIDERS

grasps a cord with each foot and goes sailing upward and away on the breeze. Often the silk thread does not prove sufficiently buoyant in which case it will be cast adrift and a new one started. These cast-aside cords may often be seen caught on bushes or floating in the air.

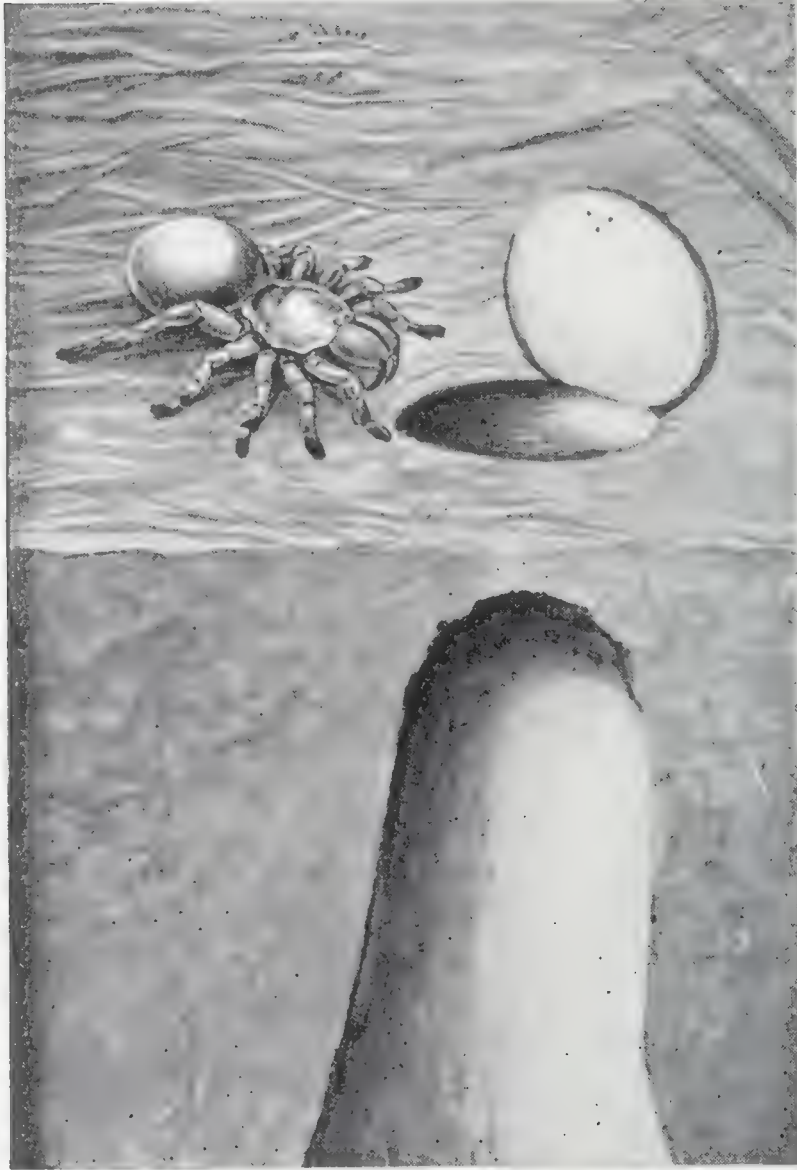
If conditions are favorable, our spider may journey for miles in his self-made airship. He has, moreover the power of coming to earth at will for he has but to wind up in a little ball with his legs sufficient of his supporting cord to take away its buoyancy.

Far from being as dreadful as generally supposed, I think you will agree that some spiders at least may prove interesting; you will never know how very interesting until you go afield and study them in life. They all have different manners of securing their prey and of handling it afterwards; they make interesting silk cocoons of many forms to receive their eggs; they have interesting methods of evading pursuit from their enemies as well as ways of luring their victims.

Nearly all creatures that have enemies have, or try to devise, ways of escaping them. Because of the enmity of wasps and because wasps do not hunt at night, the majority of spiders remain in concealment during daylight but become active, spin their webs and catch their prey at night. Even this does not serve to escape the solitary huntress wasps for they ferret out their victims in their hiding places.

In the southwestern states there is a large vicious wasp known as the Tarantula-hawk because of its fondness for these large, poisonous spiders. This same wasp also preys upon a slightly smaller spider known as the Trap-door Spider, so called because, to escape this wasp, it makes a silk-lined underground house covered with a perfectly-fitting, silk-hinged cover; this cover is made of alternate layers of silk and earth, the top being a perfect imitation of the surrounding ground. The spider runs into her home, pulls the lid down, and stays during daylight trusting that her hiding place may remain undiscovered.

But our fields do not cater solely to those Nature-students who desire to study insects for on every hand are beautiful flowers,—daisies, buttercups, dandelions, bluets, clovers, milkweeds, etc., turn their faces upward inviting out inspection. If we make a little study of any of these



TRAP-DOOR SPIDER AND NEST

Showing the silk-lined underground portion as well as the door. This cover fits so perfectly that close examination is necessary to see the joint.

we will find that they lead right back to some of the insects. In fact, insects seem to be everywhere and in everything sometimes playing an useful part but more often a destructive one.

As those milkweeds along the wall seem to be so attractive to the bees and butterflies we will give them some of our attention too. There are several species of milkweed, some with white flowers, some with purple, cream-color and orange. Most abundant of these is the

COMMON PURPLE MILKWEED.

The pretty, drooping clusters of lilac-colored flowers have a very sweet odor, so sweet that many people do not like it. They are favorites of many insects though, for within each flower are five little cells or cups, each overflowing with nectar or "honey".

Commonest among its butterfly visitors is the large black and red kind shown in the little colored picture. This is called the "Milkweed Butterfly" because it likes these flowers so well and because its caterpillar feeds upon the leaves of the milkweed. The milky juices of milkweed are very bitter; it is supposed that these give a disagreeable taste to both the caterpillar and to the butterfly for few birds will eat either of them.

We have shown earlier in this book that pollen from one blossom must be transferred to the stigma of another in order that the seed may be fertile, or capable of growing other plants, and that in many cases it was necessary for insects to do this. Milkweeds have a very clever and interesting arrangement to force insects to work for them. An insect in moving about on the flower gets his leg caught in one of the five clefts at the base of the flower; it easily slides up the slot and catches firmly in a tiny notch on the slender stalk that connects two little pollen masses. In order to get free, the insect must tear

these from their places and then can go flying away to other flowers with them dangling from his foot.

Often small bees and butterflies are unable to get free from this trap and die hanging to the flower;—victims because they are not strong enough to do as the plant wishes and carry the pollen to other blossoms.

Ants are of no value to most plants and they do steal a great deal of nectar, if they can get to the flowers; most plants try to prevent this by growing small hairs on the stems so that it is difficult for ants to crawl up. The stem of milkweed is smooth but the outer skin is so thin that the ant's sharp claws break through it and he gets some of the sticky, milky fluid on his feet; if he persists in climbing, he gets so hopelessly entangled as to often cause his death.

The final effort of plants each year is to spread their seed. Milkweed has adopted the very excellent plan of providing each seed with a beautiful, silky parachute so that they may float away for long distances on the wind. A great many of these seeds, with their parachutes closely folded, are clustered in a large pod that takes the place of the flower cluster until it bursts and lets loose the silky-plumed seeds.

There is another class of inhabitants of field and meadow that I am particularly glad to mention for two reasons:—Because their economic importance is seldom recognized and they are ruthlessly slain at every opportunity; and because of the natural, inborn horror that is needlessly experienced by nearly every one at the sight of

SNAKES.

Snakes may be regarded in several ways:—One may scream and run at the mere sight of one, which of course is unreasonable; one may secure a rock or club and destroy them, which is cruel and unwise; one may handle all kinds with impunity, which is folly; or one may quietly study their habits and become familiar with the different species and their values, which of course is the sane and prudent course to take.



Snakes may be found on any warm day after the appearance of skunk cabbage.

There are but two species of poisonous snakes in the northern half of the country,—small Rattlesnakes and the Copperhead. Both of these are very dangerous and should be avoided,—an easy matter since they are not common, are found usually only in rocky ground or ledges where few go unless in search of them, and they always warn one of their presence before striking. The “rattler” warns by shaking the horny rattles on the tip of the tail, making a whirring sound like the rapid rustling of dried leaves. The Copperhead makes a similar sound by rapidly vibrating the tip of his tail among the leaves. Both of these species will glide away and escape if possible from man; they strike only in self-defense. All the viparine snakes, to which class the Rattler and Copperhead belong have broad, triangular-shaped heads viewed from above and the tail portion of the body is stout and rather abruptly pointed; avoid snakes so formed.

It is not the intention of these sketches to identify the different species; large volumes would be required to do so. Our aim is rather to show that reptiles as a whole are not creatures to be dreaded, but rather to be admired for most of them occupy quite important places in the economic scheme of Nature. As books devoted to snakes are so very few in number, I will call to the attention of any who are desirous of studying the subject, the “Reptiles” by Raymond L. Ditmars,—a very complete, very readable and comprehensive, and finely illustrated work.

Snakes are of two kinds, oviparous and viviparous,—the former laying eggs and the latter bringing forth their young alive. Fox Snakes, erroneously called “adders”, Black Snakes and Green Snakes lay eggs, while Water Snakes and Striped Garter or Garden Snakes produce living young. These are the species most commonly found in northern United States and are all perfectly harmless.

The Black Snake is one of the most active of reptiles,—so active that often it is with difficulty captured. Far from being the aggressive creature that many like to picture it, it will glide away very rapidly upon our approach and un-

doubtedly wishes that it might go twice as fast. It has small teeth that are capable of scratching the hand but it has no venom. They will fight when cornered and large specimens should be handled carefully, not because they are snakes, but because scratches of any nature may prove serious.

If a large individual is grasped back of the head, it will at once coil about the arm but with only a slight pressure for it has no power of constriction. Its food consists chiefly of mice and frogs and, in summer, of young birds and eggs; in search of the latter, it often ascends trees and bushes. It is therefore, both a beneficial and destructive creature.

During June, the female deposits from ten to twenty, elongated, white eggs under a stone or in soft earth. These hatch in about a month, the tiny snakes, about eight inches long, being blotched with gray and white.

Green and Striped Garter Snakes feed almost wholly upon insects, with mice and frogs for variety and occasionally bird eggs. They are most inoffensive creatures and many farmers encourage them to remain on the premises.

Both the Green and Garter Snakes have tiny teeth, too small to make an impression on the hand, but designed to assist them in swallowing their prey. Snakes when excited or alarmed have a habit of rapidly projecting and retracting their forked tongues. The tongue is an organ of touch, solely and, of course, is perfectly harmless, although it is often regarded by mis-informed children as the snake's "sting".

Green Snakes are perfectly at home among the branches of bushes; in fact one of the best ways to find them is to shake the bushes in favorable localities and then watch for movements; they are very difficult to see for they match the leaves perfectly in color. I had found a nest of a White-eyed Vireo one day; it was in a thick tangle of briars but I managed to make an opening and put my head in to see what the nest contained. I was conscious of something swaying directly in front of me and, focussing my

eyes upon it, I saw the wide open mouth of a green snake not more than three inches from my eyes. I dodged back so quickly that, for days following, I had numerous



Snakes often climb among the lower branches of bushes.

scratches from the briers to remind me of the event. This particular snake which by the way was the southern variety that attains greater size than the northern ones, was the largest that I ever saw, measuring four and one-half feet although the body was scarcely a half inch through.

It is a common habit for all large snakes to eat smaller ones of other species. I have often seen Water Snakes dis-

gorge other species when captured and I once saw one of these handsome snakes slowly gulping down a garter snake that in turn had been struggling to down a frog. Both disappeared down the throat of the cannibal easily, although the victim was at least two-thirds as long as its captor.

That snakes have any mesmeric, hypnotic or "charming" power, as is often believed, has been amply disproved by many observers. A person under sudden great fear or peril may become "rooted to the spot". Perhaps an occasional bird might become so afflicted at the sudden appearance of a snake, but if so it would be no power of the serpent that caused it.

There is a certain mammal that may sometimes be seen in fields, particularly towards dusk,—a handsome black and white mammal usually regarded as offensive, namely

THE SKUNK.

Now this animal is offensive if, as usually happens, it is pelted with sticks and stones whenever seen; under such circumstances we might expect it to use any defensive weapons that it could. And skunks do like poultry,—there is no question about it. But the man that admits that one of these animals is stealing his chickens, admits that his poultry yard or farm is not kept as it should be. A skunk or a fox cannot steal chickens that are properly fenced.

This little sketch is not written in defense of *Mephitis putida*, as the skunk is technically termed, but to prove that even under unusual circumstances this animal is not at all offensive if properly treated. The following actually occurred and was witnessed by many people besides being photographically recorded.

Dr. R. and wife were tenting on Wigwam Hill. Provisions were kept in baskets and boxes in one corner of the tent beside one of the cots. One night the Doctor was

awakened by a rustling and crunching in the corner. He cautiously reached his pocket electric light and turned it in that direction. Lo and behold,—a real, live, wild skunk had the cover off a basket and was vigorously and greedily sampling the contents. The turning on of the light did not alarm his skunk-ship at all and the Doctor, a Nature-student himself, being President of the Worcester Natural History Society, instead of throwing something at the intruder as others might have done to their sorrow, aroused his wife and they watched the animal until it left of its own accord.

Evidently this was too good a “strike” to be neglected for the skunk reappeared at the same hour the following night and also the next one. It was found that cheese was his favorite of everything that was offered and it was also discovered that he would come just the same at the same time even if the Doctor and visitors were waiting to watch him in the dimly lighted tent. He would come marching boldly in as though he owned the place and we were his guests. Many evening parties were formed for the purpose of witnessing the novel sight.

As he did not care when the rays from an electric lamp were thrown upon him, it was suggested that probably he would stand for a flash-light photograph. So the experiment was tried. It was with many misgivings that the first flash was touched off. Doubtless most of the ten persons present were wondering what they would wear the following day should the worst happen. The experiment worked like a charm; not a movement on the part of the animal showed that he thought the flash anything out of the ordinary. His nerves proved more steady than those of most of the humans present. He was portrayed in about ten different poses, taking food from the hands of several of those present, one of the best of which is the one that shows him reaching up for a bit of cheese Mrs. R. is holding.

This animal made almost nightly visits for more than a month and then disappeared, but this goes to show that



A WILD SKUNK FEEDING FROM THE HAND.

Photographed at night by flashlight.

a skunk, if not molested, is very inoffensive and need not necessarily be avoided. Nor was this skunk an exceptional one. I have repeatedly passed them at distances of from three to six feet without their acting in any untoward manner. Those who have kept them in confinement agree that they are very mild mannered.

Economically, the skunk is both good and bad. When insects are to be had, the bulk of his food is made of them, chiefly grasshoppers and crickets. Many mice are dug from their burrows, snakes are caught, an occasional rabbit is captured while asleep. All their prey must of necessity be caught by stealth for they are very clumsy animals and can neither spring nor run fast. If they did not so often destroy the eggs and young of ground-nesting birds, they would be regarded as very useful creatures.

POND AND SWAMP LIFE.

Many of my pleasantest excursions have been those around, about or even in small ponds such as are to be found dotting the country everywhere. Such localities furnish a great wealth of the most interesting material for study and thought.

Our approach is heralded by the warning rattle of a Kingfisher, perched on a dead branch where he can easily watch the placid waters in hopes of securing some of the small fish living therein. A bittern, standing knee-deep in the water, waiting for a chance to spear a venturesome frog, raises his head and assumes a rigid attitude mimicking the rushes about him, but as we continue to approach he flaps heavily and disgustedly away.

Whirligig-beetles chase themselves in eccentric circles, water-striders skim over the surface, mosquito larvae, backswimmers, water-boatmen, caddis-worms, salamanders, tadpoles, frogs, turtles and hosts of other creatures may be



A. BLUETS; INNOCENCE.
B. PARTRIDGE VINE; TWINBERRY.

*Bluets are among the most abundant of our field flowers,
while Partridge Vine carpets the ground in woods.*



A. COMMON VIOLET.
B. CANADA VIOLET.

Everyone likes violets. A number of varieties grow in most swamps or in moist places.

seen in the water. Surely there is material in abundance here to last one a life-time.

We will, however, focus our attention for awhile on those great insect-hawkers,

DRAGON-FLIES OR DARNING-NEEDLES.

Just as the Marsh Hawk or Harrier courses over marsh and meadow ready to pounce upon mouse or mole that chances to expose itself, so do dragon-flies hawk over ponds looking for mosquitoes and midges. For they are among our most useful insects, feeding almost exclusively upon the many tiny, obnoxious species that multiply so rapidly. They are absolutely harmless and it is very unfortunate that the old superstition that they sew up the ears, eyes or mouths of children should be drilled into the rising generations at an early age.

If you watch one for a time, you will see that his actions are much like those of the common Kingbird. He has his favorite lookout perches and dashes out suddenly after his prey with a rapidity that the eye can scarcely follow. He also has the habit, very disconcerting to those not familiar with it, of rushing out and hovering in front of a stranger in order to carefully look him over. He means well but is quite near sighted, but not as much so as most other insects, and has to get within six feet of you before he can make out what you are.

I doubt if any living thing is without its enemies; those of the dragon-fly, besides other predacious insects, consist chiefly of birds one of which is that same kingbird that we compared to the dragon-fly in actions. In this connection we might cite an interesting cycle of events that may occur every day:—Mosquitoes prey upon man; dragon-flies devour the mosquitos; a kingbird snaps up the dragon-fly; and along comes a bad man and shoots the kingbird,—and so life goes.



DAMSEL FLY (at the left)

DRAGON FLY (in the center)

NYMPH OF DRAGON FLY

Flies and dragon-flies have most wonderful eyes,—huge convex, compound eyes containing upwards of twenty thousand simple eyes. Each of these eyes sees by itself, taking in very narrow rays of light, but the whole aggrega-

tion of them located as they are can see in practically every direction. Just think how fortunate this creature is,—possessed of twenty thousand eyes while many insects and animals have none at all; but then the dragon-fly has to hunt harder for his food and has to keep very sharp watch to escape his enemies.

Dragon-flies lay their eggs in the water, either dropping them singly or glueing them to the stems of plants just below the surface. The first stages of those insects that do not go through a complete metamorphosis are known as nymphs; consequently the little creatures that hatch from the dragon-fly eggs are dragon-fly nymphs. Like grasshoppers they get their growth by a process of moulting, shedding their old, dried skin as often as it becomes too small for them. While the nymph bears practically no resemblance to the adult dragon-fly in the first stages, each moult brings out the likeness a little more, but the wings are not obtained until the final one. During its life in the water, the young dragon-fly feeds upon mosquito “wigglers” and other small insect larvae. Thus, in its early stages, the darning-needle does as much, or even more, good than later when it preys upon the winged insects.

Dragon-fly nymphs are extremely voracious; the lower jaw is provided with an extendable scoop armed with teeth, known as a mask because it fits closely to the face so as to conceal its dangerous character. This mask is extended to grasp prey and then draws it back into the mouth. As the nymphs arrive at the last stages of their under-water life they are active and strong enough to overpower small fish and quite large aquatic insects. When ready for the final change, it crawls out on weeds or rocks, the skin splits down the back and the adult insect emerges, its wings developing rapidly from little packets on each side.

Adult dragon-flies are even more voracious than their larvae; their appetite seems to be insatiable. Their prey is almost wholly captured while in flight and is also devoured on the wing; it is done so quickly that it is almost impossible to ascertain just how. Small insects are apparent-

ly seized directly in the jaws, while large ones are grasped in the legs, all of which point forward for this very purpose and which are entirely unsuited to walking. They often seize smaller dragon-flies, small moths and butterflies, occasionally one as large as a *Papilio*, but the food consists in the main of flies and gnats.

There are several thousand species of dragon-flies and the complete life histories of none of them are known. They furnish an excellent field for the careful investigator and an interesting one for all Nature-lovers. With this brief mention we will leave the dragon-flies and turn our attention to those dark oval objects perched on the floating log across the pond:—

TURTLES.

The turtles most often met with are the Painted Terrapin, the Speckled Terrapin and the Mud or Snapping Turtle. The two former species are most frequently seen basking on floating logs or stumps, ready to slide off at the least indication of danger. The Painted Terrapin is the most beautiful of all pond turtles, readily recognized by the red and black markings around the circumference of its shell, these showing most brilliantly on the under side. The Speckled Terrapin, which has bright yellow spots on its black upper shell, is also very common in slow moving brooks and ditches.

The natural food of pond turtles consists of water insects, shell-fish, tadpoles, frogs and fish. Therefore it is not safe to introduce any except the very smallest into aquaria containing fish. They can be easily kept by themselves, however, feeding them upon bits of raw meat, fish and flies. There is some doubt as to the economic value of turtles, some maintaining that they are very useful for destroying weak or sick fish that might otherwise contaminate the healthy ones, while others claim that they catch and devour quantities of healthy food fishes. I think there



MOCCASIN FLOWER.

Other "Lady's Slippers" are white, yellow or red and white; the pink one is the most abundant. It is found in dry woods.

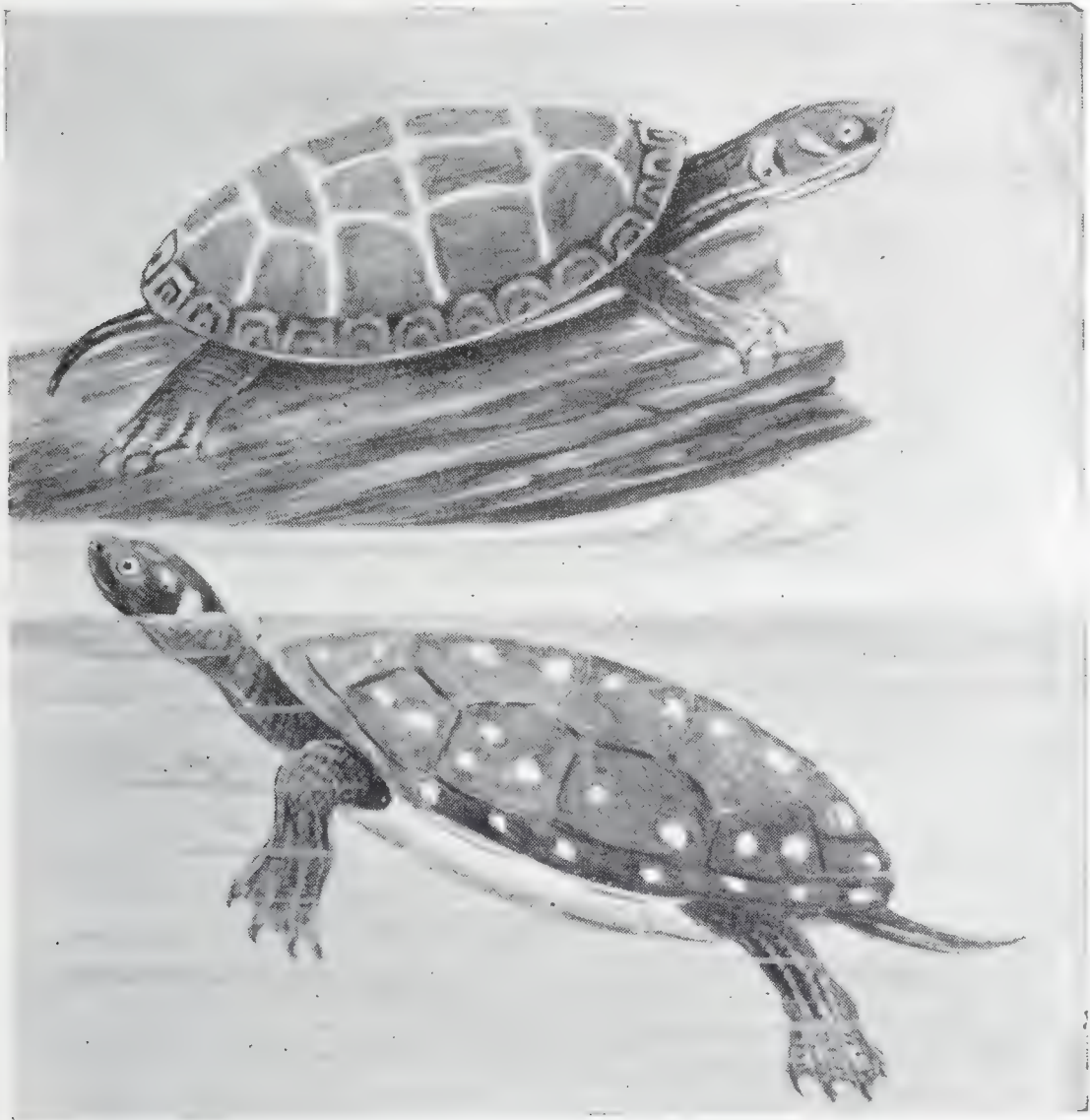


PITCHER PLANT.

Growing in swamps where the carpet of sphagnum moss allows one to sink into water at each step.

is little doubt but what the Snapping Turtle is a menace to all kinds of fish.

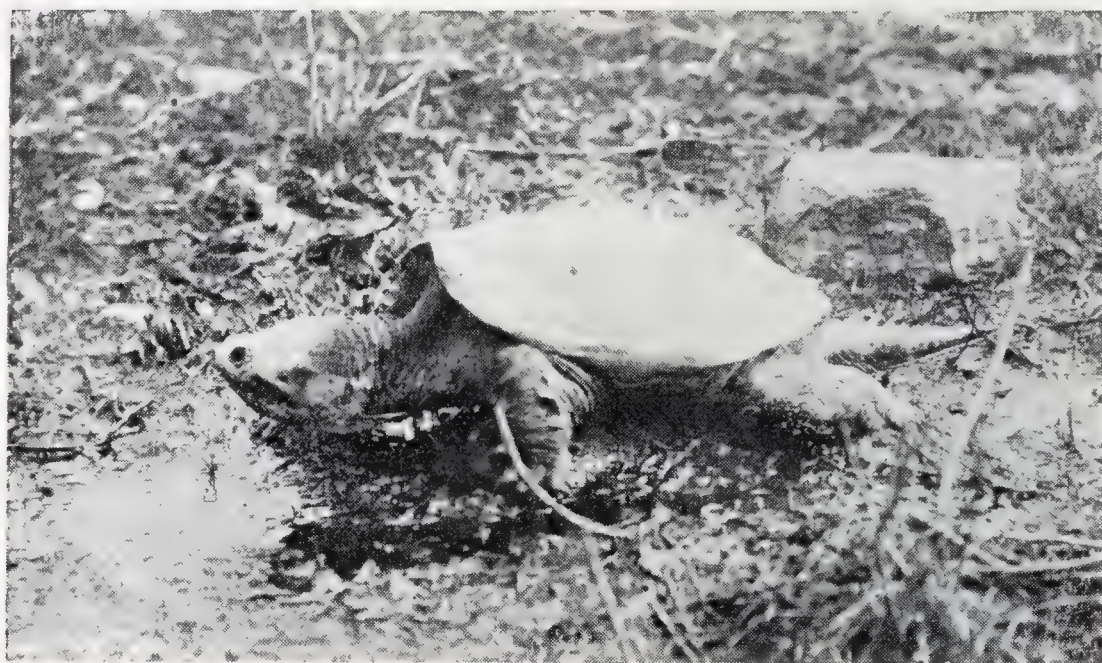
The flesh of the Snapping Turtle is highly prized by some human epicures but it is so well protected by its shell



PAINTED TERRAPIN (upper)

SPECKLED TERRAPIN (lower)

that no other animal seems able nor cares to feed upon it after it becomes of fair size, except leeches which are usually found clinging to the fleshy parts of old-timers. It is the most ferocious and omnivorous of American turtles, preying upon fishes, batrachians, mollusks, dead animals or even pulling quite large ducks beneath the surface of the water and devouring them; other food supplies running short, it will fill its stomach with any succulent vegetables.



A LARGE SNAPPING TURTLE.

Each individual or pair seems to have its own particular territory and one seldom encroaches on the preserves of another unless the latter be much smaller and weaker. Passing the greater portion of its existence under water groping in the muddy bottoms, they nevertheless often make long journeys overland in search of new pastures or ponds for feeding. It is during these wanderings that most of them are captured, although occasionally an angler

will get one on his hook or a marksman bring one down with a well-placed rifle ball. They are very tenacious of life, chloroform seeming to be about the only medium to quickly end their career. They also have a bulldog-like stubbornness in hanging to anything when their anger is aroused. I have seen one weighing forty pounds carried a distance of half a mile while suspended from a stick solely by the grip of its jaws.

Upon the approach of winter, they bury themselves



A turtle weighing 40 pounds hanging solely by the grip of his jaws.

several inches deep in the mud and pass the cold weather in a torpid condition. During June, the females lay in the neighborhood of forty eggs each in holes that they dig near the edges of ponds or rivers. The little turtle grows rapidly for the first year, but their development thereafter is slow, being more and more retarded as they increase in years. Turtles live to be very old. Undoubtedly some of the forty and fifty pounders are older than the most aged living humans. Some of the captured Galapagos Tortoises are estimated to be more than two thousand years old.

All turtles have the snake-like habit of hissing when angry and of very suddenly and unexpectedly darting the head forward to seize their prey.

FROGS.

Frogs and their tadpoles are, of course, familiar objects to everyone but they are always interesting,—doubly so, perhaps, because they can so easily be raised in captivity. Every well-regulated schoolroom has one or more tanks for the study of amphibious creatures.

There are differences in the habits of many species of frogs. Their eggs are always jelly-like in substance but some are laid in long strings, some in masses attached to plants, some floating and some dropped singly. Some tadpoles, too, develop into frogs within a few months, some do not change for a year and those of the common bullfrog remain in the “polly-wog” stage for two or more years often being enormous creatures before changing. We will delve a bit into the life history of the most attractive species,—

THE LEOPARD FROG (*Rana pipiens*).

Besides being a handsome frog, the leopard is probably the most abundant and most widely distributed species.

It does not even confine itself strictly to the neighborhood of ponds but often wanders to long distances from water. We are apt to see them giving long, low leaps ahead of us as we cross any meadow. If water is near they make straight for it and with a most graceful dive, disappear with comparatively little splashing. The frogs vary greatly in ground color, being green, gray or brown, but as would be suspected from their name, they are strongly and handsomely blotched, each spot being margined with a lighter color.

Leopard Frogs are among the first to appear in spring, being preceded only by the small tree frogs, usually designated as "Spring peepers." The leopards have peculiar but musical voices, low in pitch and low in volume. During the latter part of March, their eggs are laid in masses in the shallow water about the edges of ponds. These masses may be attached to vegetation or left floating; they contain usually from two thousand to eight thousand eggs. These numerous eggs are tiny, black above and white below, the white being food-yolk upon which the developing tadpole is to live; each egg is encased in a gelatinous substance.

If we look at these eggs daily with a magnifying glass we can see the interesting changes that take place. On the third day the eggs commence to elongate and in two days more we can make out the head and where the tail is to be. On the ninth or tenth day, the tiny tadpole wriggles out from the jelly mass, being then about one quarter of an inch in length.

They remain rather quiet for a few days, their internal organs meantime developing. On about the sixteenth day their mouths open and they become full-fledged tadpoles,—very active, dashing quickly and aimlessly about, devouring the slime or minute algae that is always forming on stones or plant life. They have turned lighter in color, in fact just matching in shade the muddy bottoms on which they rest when not swimming wildly about. This color-protection seems to be the only protection they do have

from enemies for they are apparently heedless of danger. And dangers await them at every turn. Eight thousand eggs seems a vast number for a single frog to lay, and it is; but the enemies of "polly-wogs" are so very numerous that barely enough of them mature to maintain the usual frog population. Fish, turtles, birds and scores of kinds of water beetles and ferocious larvae take their daily toll from the unsuspecting tadpoles.



LÉOPARD FROG

By May, the hind legs have commenced to sprout and during the next two months the fore legs will develop, and the tail will be absorbed, the eyes and mouth take the shapes of those of the adult frogs and in July and August the pools will be swarming with small, brightly-spotted Leopard Frogs. Those that live to become frogs get their revenge upon many of the insects that preyed upon their comrades for the food of frogs is largely insectivorous. In the water they devour the larvae of all sorts of insects and on the land they capture hosts of grasshoppers, crickets,

spiders, etc. They are wary now, and they have to be for they are regarded as delicacies by man, beast, bird and fish. With the chances about one hundred to one in favor of their dying a violent death, it would not seem that life held very rosy prospects for frogs but a visit to the marsh or pond when the frog chorus is practising, and it usually is, would convince anyone that these batrachians think life worth the living.

PITCHER PLANT.

Bogs and swamps furnish excellent hunting grounds for the naturalist. Rare birds, little-known insects, exquisite orchids, beautiful butterflies, that can be found nowhere else, may be located in such little frequented places.

The Pitcher Plant is one of these swamp flowers that comparatively few ever see growing in its haunts because it usually is necessary that rubber boots be worn in order to reach them. The shape of the leaves and form of flowers is shown in the colored picture. The leaves, which number from four to a dozen or more, all radiate from the center, forming a rosette that may be as much as two feet in diameter.

The young leaves are a very light green, the older ones are dark green and leaves of the preceding year are more or less of a reddish-brown hue. The openings of these leaves all turn upwards and the interiors are usually filled about half of water, some of which comes from rains and some probably being sucked from the soil below.

The handsome nodding blossoms attract our attention during May and June but the pitcher-shaped leaves are interesting all the year. Examine one closely and you will find that the interior near the opening is covered with tiny hairs pointing downwards. Insects are often attracted to these leaves perhaps for a drink from its cup, perhaps as a place of concealment or more likely by the slightly sticky sweet substance found just below the rim, within. The plant is very inhospitable for many insects, having

entered the pitcher, never leave it alive. Whether imprisonment and ultimate drowning is due to their inability to scale the slippery walls and the barrier of hairs or whether, as some botanist claim, the fluid in the leaf takes the form of a mild drug or intoxicant and overcomes them, can only be guessed at until experiments have proved conclusively.

These trapped insects are absorbed into the plant's system as they decompose; as the pitcher plant thus lives partially at least, upon animate matter it is usually known as one of the insectivorous plants. The sundews, little plants with leaves also arranged in the forms of rosettes, are also insect-eating plants. Their leaves are covered with fine hairs that are in reality little tubes. Tiny drops of very sticky, dew-like liquid are exuded from the tips of these hairs; attracted by these, small flies become entangled and the leaf slowly furls up and devours its victims.

Probably the most wonderful insectivorous plant in the world is the Venus' Fly-trap, a plant that is found in certain bogs in eastern North Carolina: It certainly has the most restricted area of distribution of any North American plant. Each leaf of Venus' Fly-trap, and by the way they, too, all radiate from the base, rosette-like, has a circular section at its end, the two sides of which have the power of closing together quickly upon the midrib as an axis. The surfaces of these tips are sensitive,—a fly alighting on one is almost invariably caught by its sudden closing. After having caught a victim, that leaf remains dormant for several days while the prey is being devoured.

Most interesting of all plants, however, are

ORCHIDS.

Orchids are the most highly specialized flowers that exist. They include some of the rarest and most valuable plants known, from a monetary point of view. Some are exquisitely beautiful, others are very ugly, and all are very peculiar in shape. Practically all of them are infertile to



CHIPMUNK.

▼ *He lives in stone walls or in holes in the ground. He can climb trees but is nowhere near as agile as the other squirrels.*



SWEETBRIER; EGLANTINE.

In rocky pastures and along stone walls, this rose may usually be found. Not as large as the common Swamp Rose, it attracts our admiration because of its profusion of bloom.

their own pollen and very many of them are adapted to the visitation of certain species of insects. It is because this certain, necessary insect so often fails to appear that many of the orchids are so very scarce. The corollas of



GREEN ORCHIS—SPHINX MOTH

all orchids are composed of six parts but at least one of these is always peculiar in form; sometimes it is a large irregular pouch, again it may be a platform for insects to alight upon or it may be a slender nectary tube.

A common, but interesting species, that grows in many bogs and swamps is the large Green Orchid of the genus *Habenaria*. The lower petal retreats into a slender tube about an inch in length, this tube being a reservoir for nectar with which to reward the proper insect visitor. The tube is much too long and too slender for any of the bees to reach the sweets and the color is not an attractive

one for butterflies. What, then, is the creature that this blossom is designed to woo? It proves to be one of the sphinx moths,—those night-flying, hummingbird-like insects that we may find about our garden flowers on nearly any pleasant evening after dusk.

An examination of the structure of the flower shows that the stigma is a little sticky patch in the throat of the blossom. The pollen is gathered into two tiny pear-shaped bundles in pockets, one on either side of the throat; each of these bundles is connected by a short, slender filament to a sticky disk or "button." The sphinge, as sphinx-moths are commonly called, appears. Sometimes it takes its food while hovering as a hummingbird does or it may alight on the petal-platform that is extended for it. In either case, in order to reach the nectar with its long tongue, the face is pushed well into the throat of the flower and each eye comes in contact with one of the sticky pollen-buttons. As the moth head is withdrawn, the pollen-masses are also withdrawn from their pockets, one plastered to either eye of the sphinge. Strange as it might seem, these do not to a great extent annoy the insect for it must be remembered that each of the apparent eyes is in reality a great compound one composed of thousands of simple eyes and the covering of a few of them would not affect the sight of the creature in the least.

When the sphinge leaves the flower these pollen masses are pointing upward and if they remained in the same position they would simply be pressed into the pockets of the next blossom visited. But on exposure to the air the connecting stalk between the pollen and the button contracts, and the pollen masses are brought forward into just the position to be pressed against the stigma. Some, at least, of the grains are left at the door of this blossom and the moth may even get other buttons attached to its eyes. They have been caught and found to have four or five on each eye.

Nearly every species of orchid has a way of its own for compelling visiting insects to work for them, so that there is practically an unlimited field for the observer along these lines. I will mention but one other, the common pink Moccasin Flower or Ladies Slipper. That most useful of insects, the bumblebee, is the one that we shall see visiting the Moccasin Flower. He knows that there is plenty of food inside the handsome pink sac. The only entrance for him is in the fissure in the front; after considerable struggling he is able to force his burly frame through and the opening closes behind him.

Dinner finished, the next thing is to get out; he looks up to the base of the flower where two spots of light show,—that is the way. He struggles along the narrowing passage past an obstructing stigma that brushes from his back any pollen that he may have received from the last “slipper” visited. Continuing along the passage, he reaches an anther waiting to clap a fresh load of pollen on him; thus, fully charged, he emerges and flies to the next plant to repeat the operation.

ALONG THE BROOK.

There is a strange fascination in following along the winding banks of streams. Well-trodden paths show that for ages the same fascination has existed. This fascination may be the soft murmuring, gurgling notes of the water eddying around corners and tumbling over boulders; it may be the songs and visions of beautiful birds that are likewise fascinated by these surroundings; it may be the attractive flowers that bloom by the brookside,—the Dog-tooth Violet, called “Fawn Lily” and “Trout Lily” because of the handsome spotting of its leaves, and the brilliant Cardinal-flower, that gem so attractive to hummingbirds and to mankind; and then we have the fisherman, attracted by and hoping to capture in some of the deep pools, that most beautiful of fresh-water fish.

THE BROOK TROUT.

Like shadows, we may see the dark forms moving slowly to and fro in the darker, deeper parts of the brook. Occasionally one, deciding to seek new feeding grounds or perhaps to visit a neighbor up-stream, dashes through the rapids, just a glimmer of gold and silver marking his course. To look at trout from the foot-bridge crossing the stream or from a rock overhanging a favorite pool one can admire their grace and speed but can get no idea of their beauty of form and coloring.

Gamey,—they will fight every instant from the strike of the cruel hook until placed in the creel, and toothsome; the two attributes that endear them to the fisherman to such an extent that they are being hunted to death. Many streams know them no more, where once they were abundant. Years ago, trout weighing five to eight pounds were a common occurrence; now the capture of one in any except the most remote streams weighing more than two or three pounds is a noteworthy event.

Many trout, especially the larger and older ones frequent the cold depths of lakes, but the younger and active fish inhabit brooks, particularly those with swiftly running water over sandy bottoms, with numerous deep pools and rapids, and well fringed with bushes for protection. Trout have excellent appetites and like a variety of food. A White-footed Mouse accidentally loses his hold while climbing about the exposed, overhanging roots of a tree, and falls into the pool below. It is the signal for a short but very exciting race between the three trout that happened to dwell in that very pool. A violent upheaval of the water, and the winner seized the unfortunate rodent, his momentum from the swift dash carrying him full out of the water. A blundering moth barely touches the surface of the water, but ere it can free itself, it is in the capacious maw of a hungry fish.

A dragon-fly alights upon the end of a dead twig, two or three inches above water. He, too, has a voracious appetite and is at the very moment looking about for passing insects upon which to pounce. Alas,—his thousands of eyes failed to note the enemy below him. With a swish, a silvery, speckled body hurls from the water, turn gracefully on one side and disappears within the depths, but the dragon-fly has gone with the trout, back to the very element, perhaps to the same pool in which it lived while in the larval or nymphal stage.

A Striped Dace hurries by on its way up-stream, but its hurry is too slow for the lightning-like dash of the "speckled-beauty," and there is enacted another of those very frequent tragedies when fish eats fish. A sand-darter that had been quietly resting on the bottom, concealed by its protecting coloring, suddenly leaped for a "wiggler" that was floating with the current but almost before it had caught its prey, it in turn became a victim.

A Leopard Frog, wandering along the edge of the brook, startled by a boy coming along the path gave one long, lusty leap,—the last that he ever would make, for a large trout that had been lying in wait, met him as he



BROOK TROUT

struck the water. The small boy paused in wonder:—"My, that must have been a whopper!" With which words he hurried home, got a hook and line, hastily cut a short pole and scoured the meadow until he found a frog. With this combination he soon landed a four-pound beauty that the city man with his expensive tackle and large book of flies had spent days trying to secure.

But trout have their fads; at certain seasons or even on certain days they conclude that they want a certain kind of food and nothing else, no matter how temptingly offered, will serve to attract them.

During the fall, the males are more brightly colored than at any other season. This is the time that they choose their mates or are chosen by them. The spawning season is from September until the end of November, at which time the fish ascend the smallest streams almost to their sources. The number of eggs laid varies from about one hundred to two thousand depending upon the size and age of the individuals. These lay upon the gravel bottom in shallow water until the water is warmed during the following spring, at which time they hatch. Thus from three to six months may elapse between the laying and hatching of the eggs. During the next few months, the young trout fry in common with those of other fish are subject to the depredations of countless enemies, worst of which are the very numerous water insects and larvae of those species that hatch in water.

Trout can very easily be kept in an aquarium provided with running water and will do well if fed with chopped liver, varied at times with small fish and insects. It is only in such confinement that the beauty of the living fish can be fully realized.

CADDIS FLIES.

Probably most of my readers have at some time or other, stretched themselves at full length on the bank of the brook and idly watched the things that went by with the current or that made up the bed of the brook. Many curious things may be found in the brook.

Perhaps the bottom of the brook is covered with pebbles. As you watch you may be astonished to see some of these pebbles moving,—not only moving but travelling slowly *against* the current. Let us take one of the moving pebbles and look at it closely:—We find it is not a pebble but a lot of little pebbles firmly held together; still further investigation shows that it is not solid but is a hollow tube of pebbles lined on the inside with silk. We look inside, but see nothing. Put it carefully in shallow water where you can watch it closely. Presently it rocks a little, then a head appears at the opening, then a quarter of an inch of body, its tiny legs frantically clawing at the bottom; at last they get a grip, the pebble house turns over into a better position and under the influence of a strong pull slowly moves ahead.

The occupant of this novel house is the caddis worm, larva of the caddis fly. There are a good many species of caddis flies, the larvae of all of them living under water. All of these worms build some sort of a house,—some use pebbles, some tiny sticks or straws and some leaves. Whatever they are made of, the material is held firmly together with silk spun from the mouth of the worm, and the cavity is smoothly lined with the same material. You often see several styles of homes side by side in the same brook.

Of course the object of making these houses is a protective one; there are many predatory water beetles that would be glad to get at such toothsome morsels as caddis worms but the latter either escape notice or their armor is too strong. Some of these cases are anchored to larger stones or pebbles but the majority of them are free to drift or to be carted about by their occupants.



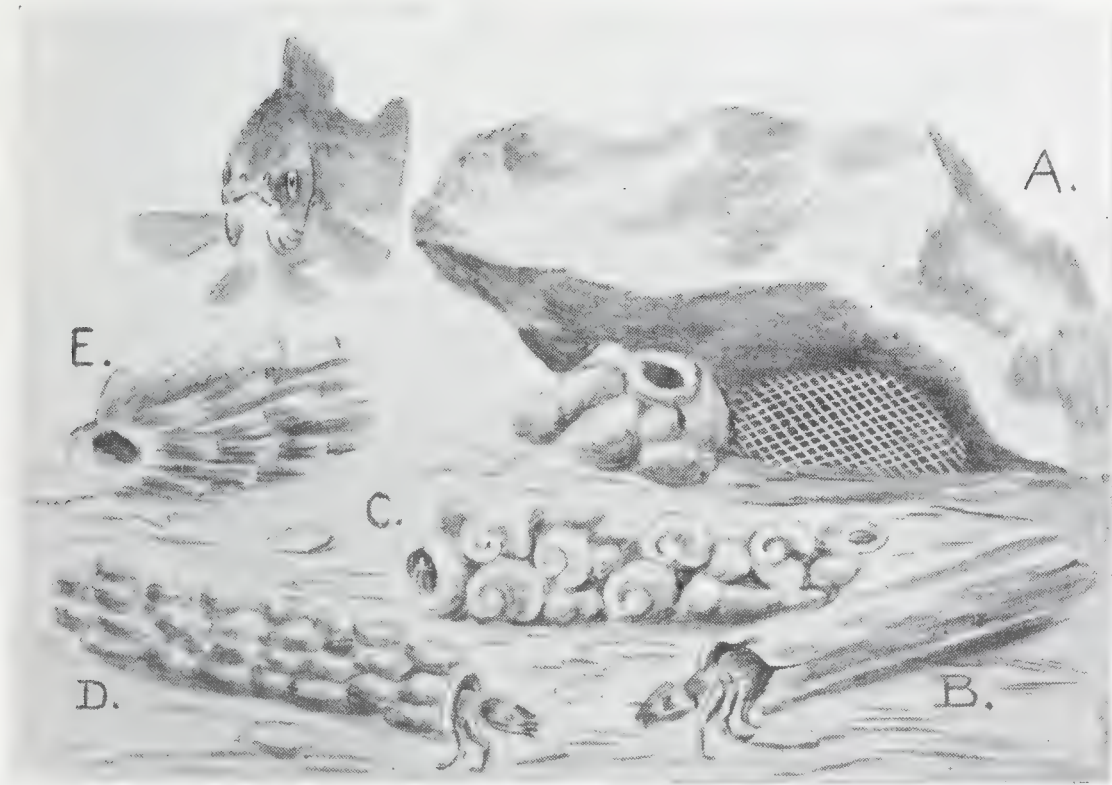
TURK'S CAP LILY.

A very common lily in suitable places. Some stalks have very many of the handsome pendant blossoms at the top.



JEWELWEED; TOUCH-ME-NOT.

We find these little orange cornucopias in moist places, usually about ponds. In fall their seeds are shot forcibly from coiled pods.



A. Home of the Net-building Caddis fly. B. House made of hollow section of stick. C. Made of snail shells. D. Home of pebbles. E. Composed of straws.

Since these worm-like creatures are in reality larvae, they must enter the dormant or pupal state before becoming a full-fledged fly. When ready to change, the larvae blocks up the entrance to the home with a pebble, leaving sufficient space for a circulation of water, or it may weave a gauze web across the entrance.

As soon as the newly developed insect leaves the pupal case it swims rapidly to the surface, using its middle pair of legs as oars. Its wings are folded in little packets on each side of the body but instantly upon coming into contact with the air, they expand to their normal size and away flies the fully developed caddis-fly. Comstock esti-

mates the time of leaving the water and flight to be less than a second. This rapid drying of the wings occurs in many insects hatched below water; it allows them to emerge and take flight before being deluged or washed away by the constant ripples or little waves.



THE CADDIS-FLY

Caddis-flies are very common in woods and often are attracted by lights and found in houses. Their wings are gauzy and covered with fine hairs instead of scales like those of moths and butterflies. The four quite large wings are folded, when the insect is at rest, so that they slope at an acute angle. My illustrations will serve better than words to give the reader an adequate idea of the appearances of both the flies and the houses that the larvae live in.

WATER STRIDERS.

Where is the boy who has not played with or watched the strange maneuvers and acrobatic stunts performed by water-striders or "lucky-bugs" and whirligigs or "dizzy-bugs?" As soon as the brooks are free from ice, the first striders appear. They have passed the winter hidden in the mud or under stones and leaves in a quiet portion of the brook.

It is difficult to study the actions of these striders while they are in the brook because they are too active and we

cannot get as near them as we would like. But we can easily catch one in a net, take it home, place it in the aquarium and study it at leisure.

We find this to be its general appearance:—Body one quarter to three quarters of an inch long, dark brown above and silvery-white below. Some specimens of each species have wings while others do not, irrespective of sex. They have quite large bead-like eyes and rather long antennae. What interests us most, however, are the six legs; the two forward ones are short and quite strong,—very evidently adapted to grasping objects; the middle and hind pairs are long, slender and covered with fine hairs.

The tips of the long legs form the supporting surface; the body does not, unless accidentally, touch the water. We see a little dimple or hollow in the water where each foot rests. The bug is held up by the antipathy of water to un-wetted surfaces, just as a dry needle, with due care, can be made to float on the surface.

Try to touch one on the back and you find that you cannot; his legs are quicker than your hand. How does he skate about so easily. You will have to watch very closely to see and then you will probably be in doubt. The fine hairs on his feet give him sufficient purchase on the water so that he can spring forward, at the same time carrying his feet forward to their normal position. The feet do not seem to leave the water but just skim along the surface.

Catch one of them and put him under water,—he will come to the surface dry for he is clad in oilskins; this explains why he can safely navigate the sometimes turbulent brook waters.

Of course everybody and everything eats. What does the water-strider feed upon? Just drop a few mosquitos or flies in the water near them and the chances are that several of the striders will rush for them at once. Their food is chiefly insectivorous; they grasp it in their front legs, pierce it with their sharp beaks and suck its juices. Many tiny gnats and millers are continually hovering over the water, often touching the surface. It is those unfor-

tunates that are unable to get a-wing quickly enough that furnish the natural food for striders.

In May the females deposit round, white eggs on grass-stems; these hatch in about three weeks into tiny striders which at once start their career of walking on the water. There are no larval and pupal changes as with most insects, the baby striders simply growing from little ones to full-size.



We sometimes come upon a buck deer in our woodland rambles.

THROUGH THE WOODS.

The great trees tower above us,—giant chestnuts, sturdy oaks and, here and there, a pine that had the temerity to cast its lot with the others. Under foot is a covering of dead leaves and club mosses, partridge vines, chestnut burrs, and here and there a delicate, pink moccasin-flower with broad green leaves sheathing the flower stem.

Sharp-voiced warblers flit about everywhere; from a distance comes the rasping song of the brilliant tanager, while from nearly overhead sounds the sweeter, more melodious tune of a handsome grosbeak; on the side hill we hear the rolling, descending notes of a Veery, while down by the brook a Wood Thrush sings intermittantly; a self-satisfied vireo sings so incessantly that we become heartily tired of the song, pretty as it is. An Ovenbird dashes out from under foot and discloses a handsome arched nest containing five frail eggs. Out from under a fallen tree a grouse speeds away with a thunderous roar, leaving behind in a leafy hollow fourteen yellowish-brown treasures.

Birds and flowers are forgotten for a time when we happen to lean against a tall decayed stub of a tree. We see something apparently fall from the top like a bit of bark but instead of landing at the foot of the stump as it properly should under the influence of gravity, it falls in an oblique direction and finally reaches the foot of a neighboring tree. Of course we can see now that the supposed bit of bark is

THE FLYING SQUIRREL.

These little fellows are so very nocturnal in their habits that they are seldom seen during daylight unless they are routed out of their hiding places, and then only in the short space of time it takes them to reach another tree and clamber up.

Often they take up their abode in deserted woodpecker holes; again you may shake a little tree in which you notice a ball of leaves and see three or four of them sail out in as many directions. Their flight is, of course, merely a glide or a slide down the air, the skin between the fore and hind legs forming when the legs are out-stretched a plane that supports them sufficiently to enable them to glide at an angle of about sixty degrees. They are as nimble as any of the squirrels and whisk away up the trunks, flattening themselves out against the limbs so that they resemble bits of bark or lichens.

If you visit the vicinity of their homes at twilight you will see them chasing one another about, their shadowy forms sailing from tree to tree. We wish that our eyes were as keen as theirs so that we might watch them at their play. They are very easily tamed, but they keep



FLYING SQUIRREL

curled up in their little house during daylight. At night, however, their big, round, black eyes are wide open and full of mischief. They will chase one another about the room, up the curtains and along picture moulding until, hard pressed by the pursuer, they make flights across the room and start all over again.

I have caught several of the little sprites and photographed them on the ends of stumps, but I have tried in vain to induce one of them to scale through the air so that I might picture it in flight.

Flying Squirrels and the little striped Chipmunks, while of little use economically except that trees often take their origin from nuts and seeds that they have planted, do no harm, but the same cannot be said concerning the larger Red and Gray Squirrels.

Red Squirrels are very active and very destructive to the nests and eggs of birds during the breeding season. Time after time I have seen them sit in robin nests and drain the eggs, have seen them pull down bush-nests and devour the contents and have caught them in the act of taking young birds. Gray Squirrels are clumsy compared to the red species which accounts for their doing a little less damage but their inclinations are just the same and they never pass by a favorable opportunity to devour both eggs and little birds. Beautiful as these squirrels are, our country would be the gainer if every one was exterminated and in their place we would have a large increase in the more beautiful, more musical and more useful birds.

TREE FROGS.

We are all familiar with pond frogs, and with field toads but not so many of us have ever seen that frog of the woods, the Tree Frog. From June until August the trilling of these frogs is one of the familiar sounds not only of the woods but also of the orchards and often it comes from the shade trees or ornamental shrubs about the house. While we cannot help hearing the song, it is quite



TREE FROG

a difficult matter to search out the singer. I have found quantities of them but in nearly every case it was accidental and not by looking for them. Sometimes we may come across them on the ground; perhaps they were passing from one tree to another or it may be that they missed their footing on one of their long aerial leaps. Again, but less often, we may see one dozing on a limb, in a crevice of the bark or on a large leaf.



The Black Swallow-Tail and the small Sulphur Butterfly feed commonly in clover fields.



BLACK-EYED SUSAN; CONE FLOWER.

In dry fields and pastures we may find quantities of these tough-stemmed daisies.

Adult Tree Frogs measure about two inches exclusive of their long legs. Their toes all terminate in round "buttons" that are sticky on the under side. These enable them to "stick" wherever their feet may touch, so they can easily climb trees or leap from branch to branch.

Another very interesting feature about them is their chameleon-like changing of color. Those found on leaves will have a conspicuously green color, those on stones or gray bark will be a handsome shade of gray, while the one on brown tree trunks will be colored with brown. Take one from one object and place it upon another and in about two hours it will have changed so as to harmonize with it, provided that it is one of these three shades. To further the deception, they are mottled, have an irregular star-shaped mark on the back and two darker stripes across the legs; these markings, combined with the appropriate colors cause the little fellow to blend into a stone or bark background. They often spend weeks at a time in the same tree securing, after dark, an abundance of food in the shape of caterpillars, spiders, plant lice, etc.

As usual with frogs, winter is passed in the mud, either at the bottom of shallow ponds or about its edges. The common Tree Frog (*Hyla versicolor*) does not come out of its winter slumber until the latter part of April. Another species (*Hyla pickeringi*), known as the "Spring-peeper" appears in March, just as soon as the ice commences to leave. This frog is the earliest of all to appear,—its voice is usually heard weeks in advance of any other.

The eggs of Tree Frogs are deposited singly among the grass in shallow water. The development of both the eggs and tadpoles is very rapid; by the end of October, at which time they hibernate, the young frogs are about an inch in length.

COCOONS AND CHRYSALIDS.

Doubtless my reader has often, in his rambles, seen caterpillars of many kinds,—some bright colored or beautifully striped, other peculiarly shaped, stout or covered with spines. Interesting nature studies may easily be made of most caterpillars for, of course, they represent the larval stage of some species of moths or butterflies. You have but to take them home, place them in a box, one side of which is screened, and keep them supplied with the same kind of leaves upon which you found them feeding; you will then witness the interesting changes that occur.

To illustrate the life cycle of a moth I have selected the *Cecropia* (*Samia cecropia*) one of the largest and most beautiful species in our country. We may find the larva or caterpillar feeding in maples, elms and willows and less often on other deciduous trees, or one may have taken a tumble and be found crawling along on the ground. The full grown larva is fully three inches in length, very stout and a dull whitish-green color; it is covered with tubercles that are blue on the sides, yellow on top and reddish near the head. Before reaching its full size, the larva has moulted or shed its skin, three or four times. It is not a beautiful object to look upon and gives little promise of the exquisite moth into which it will develop.

Within a few days after attaining its full growth, the larva will be ready to pupate or go into the "sleeping stage" from which it will emerge a moth. Taking its position at a favorable point on a branch, it will commence to spin silken threads about it, the outer ones being firmly fastened to the twig and often drawing several leaves into the frame work. The first stages of this spinning process are very interesting for we can watch the caterpillar through the growing walls,—turning around and around and often doubling up as it lays its silken trail.

When finished, the cocoon is very firm, attached strongly to its support and is waterproof. Within, the larva be-



Caterpillar, Cocoon and Cecropia Moth just after emerging. In two hours the wings will attain an expanse of five or six inches and the beautiful moth will be capable of flight.

comes dormant; its outer skin hardens and becomes a chrysalis; the caterpillar is really going through a fifth moult but does not immediately leave the hardened skin or chrysalis. If it is early summer, the chrysalid state will last but two or three weeks but if our larva was of a fall brood, it will remain in the cocoon throughout the winter.

When the time for emergence arrives, the cocoon will show some signs of the movements within; the newly born moth breaks through the chrysalid and exudes juices that soften the upper part of the cocoon and allow it to slowly drag itself out. It is now a sorry looking object,—large, fat spotted body but with tiny limp wings. It climbs down and hangs from the bottom of the cocoon or from a twig while its wings are developing; these commence to grow immediately after it gets out into the air,—you can actually see them grow and in about half an hour they have attained their full size, but are still limp. In another hour, our moth will be slowly opening and shutting the handsome wings and may make a flight at any time. He does not have to learn to fly as little birds do; his first attempt will be a strong swift and steady one. Surely it is a most wonderful transformation from an ugly caterpillar to the beautiful imago as the moth forms are termed.

One of the most common and most beautiful of the larger butterflies is the Black Swallow-tail (*Papilio asterias*). We commonly see it in fields of clover as well as about thistle blossoms. Its life history will serve as typical of that of most butterflies.

Although the butterfly gets its food from many plant families, its larvae live almost exclusively upon members of the parsley family, either wild or cultivated; therefore the female *Asterias* visits these plants to lay her eggs. These are about the size of pin-heads, globular, yellowish-white. In a few days these turn gray, soften and the little dark-colored larvae gnaw their way out. After feeding ravenously upon the flowers, foliage and seed pods for about three weeks, and moulting five or six times, it attains its full length of nearly three inches. It is of a pale



Caterpillar of Black Swallow-tail about to pupate, and the chrysalid.

greenish color crossed by black bands on which are yellow spots; just back of the head are two tubercles or horns that are projected when the creature is disturbed; these horns are also capable of giving out an offensive odor that forms a sort of protection against insectivorous birds. The larva is now ready to go into the chrysalid state and we must watch it closely if we are to see the wonderful performance.

For this great change, it often leaves its food plant and takes a position on a dead limb of a neighboring tree or even on a fence rail. A tiny silken pad is firmly attached to the side of its support; this is designed to be grasped by the terminal pair of legs and to form the principal means of support for the chrysalid. Having anchored itself firmly to this pad, the caterpillar attaches a thread to one side of the limb, then reaching its head far back

until a sufficient length has been spun, attaches it to the opposite side; this operation is repeated until a dozen or more strands pass from side to side. The caterpillar then passes its head under the silken thread and wriggles up until they support the body about midway. This silken



BLACK SWALLOW-TAIL (*Papilio asterias*)

loop and the cushion pad are now its only supports. The creature remains at rest with head bent forward for about twenty four hours, then the body commences to twitch; the skin has become dry, it cracks and splits and the larva moults for the last time, losing the pro-legs from this hind end of the body. It has assumed the typical chrysalid form, the outer skin hardens, turns green or wood-colored and the creature remains at rest for a period of ten to twenty days,—that is, if the caterpillar was of an early brood; later ones of course pass the winter in the chrysalid state.



Little spotted fawns may rarely be seen in summer.

When the time arrives for the butterfly to appear, the case becomes duller in color, moist and soft; it soon splits up the back allowing the new-born butterfly to extend its legs; as it gathers strength it slowly emerges from the case and crawls to the branch above. Under the action of the air and sunlight the wings grow, expand and take on their brilliant colors until, in about two hours we see



GRAY SQUIRREL

Nuts, roots and cone-seeds are his usual diet but he also eats bird eggs in season

a full-grown, beautiful butterfly ready to fly away and seek flowers from which to get the nectar upon which it is now to subsist until death.

Studies of butterfly and moth life are of more than ordinary interest because of the complete changes of form of the insects and because they can so easily be observed by taking the larvae into the home or school.

Examples of incomplete metamorphosis, in which the form from youth to adult does not undergo radical changes, may be found among grasshoppers, crickets and like insects. The young are born from eggs laid in the ground and moult a number of times before attaining their full growth and wings.



ICHNEUMON FLIES.

Among the most grotesque of insects commonly seen among the hordes that frequent the autumn woods are the ichneumon flies. These flies all have an "ugly" appearance and are much feared by those who do not know of their harmless disposition. Far from being dangerous, these insects, of which there are many species, are really valuable. They are all parasitic, that is their larvae live upon those of other usually destructive insects. We will follow some of the steps in the life cycle of one of the largest species and see what occurs.

This species, technically known as "*Thalessa lunator*," is a very imposing insect frequently measuring more than six inches over all. More than half of the length is composed of the "tail," technically known as the ovipositor and what is usually known by children as the "sting." Fortunately this ovipositor is not a sting, although its use

means the sure death of a certain species of insect upon which *Thalessa* preys, known as the Pigeon Tremex (*Tremex columba*). Adult insects of this latter family are known as horn-tails because the end of the body terminates in a sharp point or horn. The larvae are known as wood-borers, many of them doing a great deal of damage to shade trees.



Tremex is an enemy to oak and elm trees. She has a short but strong ovipositor with which she bores directly into the wood for a depth of about an inch, at which depth she deposits her eggs. In about two weeks these eggs hatch and the grubs, or *Tremex* larvae, commence to bore through the wood; they live upon the wood and its juices, the boring of which when persisted in by numbers of them saps the life of the tree.

Now *Thalessa* enters upon the scene; with her arrival, the fate of the *Tremex* worm is sealed. How she knows just where to bore is a mystery man cannot solve, but she always selects a spot just over the tunnel in which *Tremex* larva is working. It is then that her wonderful ovipositor comes into play; this is one of the most marvellous drills in the world, the like of which is beyond the power and skill of man to create. Little larger than an ordinary horsehair, yet it is a tube through which *Thalessa* can lay her eggs; flexible as a hair, yet it is sturdy enough to penetrate oak. Taking her position on tiptoe, body perpendicularly elevated relative to the

branch, ovipositor curved sharply over the back, *Thalessa* commences drilling. It is slow work and hard work; it may be several hours before she gets to the necessary depth, which may vary from one to three inches. Usually when she has to drill to the latter depth she is so exhausted by the labor of boring and egg-laying that she is unable to withdraw the drill and perishes.



The Red Squirrel is one of the most destructive forces with which the small birds have to contend.

The eggs hatch within a few hours and the tiny, but active, larvae immediately wriggle along in search of the food that they know is somewhere near. They soon overtake and attach themselves to the *Tremex* worms upon which they subsist, growing very rapidly. So one insect gives up its life that another may live. Fortunately *Tremex* larva has a habit of occasionally boring to the surface, or the *Thalessa* worms would find themselves in a prison

from which they could not escape. Hurrying back along the passage until it reaches one of these breathing spots, the larva goes into the pupal state, covering itself with a brownish cocoon from which, in due course a new adult *Thalessa* will emerge.

Other species of Ichneumon Flies lay their eggs upon various caterpillars before or after they have entered the pupal state. Very often the collector, carrying home a cocoon of some prized moth, will be disheartened to find that it has hatched out a fine family of Ichneumon Flies.

SEED TRAVELLERS

A great many plants are regarded as weeds because they are so abundant and because they spread so rapidly over the country. But why is it that some plants are so prolific and increase so rapidly while others are becoming scarce and difficult to find? It is because the "weeds" grow many seeds, make sure of setting them and then take pains to have them properly distributed.

Foreign immigrants almost without exception, they are natural born travelers,—or perhaps tramps is the better word. They come to our country by "steerage," by cattle ship,

tramp steamer,—any way to get here. Once on our soil, though unbidden and not wanted, they use all their energies in an endeavor to

travel from end to end of our land.

By hook or by crook they are bound to accomplish their purpose. Seeds are shot from guns, they travel by means of two legs, some go by four, others go on wheels, many go via parachutes and quantities go a-wing. Oh, they are interesting little beggars, every one of them. They are so very interesting that I have seen persons who cared absolutely nothing about plants or botany, spend hours working over the seeds.

"Beggar-ticks"

Every day during Autumn, these little beggars put forth the glad hand to every wanderer through fields or woods. So slyly is this greeting extended that it usually is unnoticed until the clothes may have accumulated hundreds or even thousands of the clinging pests. Our wanderer, be he preacher or layman, scientist or laborer, must perforce sit him down and patiently take his lesson in botany, picking them off one by one. Probably however, beyond a few remarks in regard to "beggar-lice" in general, he will not realize that these clinging little things are seeds and that he has unwittingly founded a new colony of the plants.

Let us consider a few of these very interesting types of plants and their ways of sending their seedlings out into the world, first taking some of those that use no sentient agency for their transportation.

Everyone knows the little DANDELION that grows everywhere and blooms in season and out. Why do its flower-stems that when tipped with the golden blossoms were curved and often lying close to the ground, straighten out and grow so that the feathery balls are elevated above the grass tops? Not for display and not as objects for children to play with, but solely so that the seeds, each of which has a silky, feathery parachute attached, may get a chance to float away on the breezes, unobstructed. Of course many of them come to earth within a short distance of the parent plant, but under favorable conditions some of them may travel for miles before finding their final resting place.

The aviation method of dispersal is also chosen by the milkweeds. The large fragrant clusters of blossoms that greet us in June and July are replaced in late summer by large, coarse, pointed pods. Each of these pod houses a large number of black seeds and each one of these seeds has a number of silken filaments attached. When the proper time arrives, the pod-house bursts and the seeds go trooping out like children after school hours, to become the playthings of the winds until at last they reach secure,

final lodging places. Thistles, golden-rods, cat-tails,—in fact a great many kinds of plants send their seed-babies out into the world on the arms of the wind.

More hazardous than trusting to the wind, but equally efficient when it finds its victim, is the practice of some plants of arming their seeds with hooks designed to catch in the hair of passing animals or the clothing of people. One of the best examples of this kind of dispersal is shown by the common burdock. The burs are commonly used by children for making cradles, houses, funny men, balls to throw to one another, etc.,—uses for which the burs readily lend themselves but of course entirely different from what the plants intended. These burs are very annoying to dogs and sheep for it is almost impossible to extract them from hair without first breaking them in bits. They do not trouble people so much because on account of their size and conspicuity they can be readily seen and avoided.

There are other seeds, however, which attach themselves to us without our knowledge, being noticed only when parts of our clothing are set as thickly with seeds as a hedgehog is with quills. One of the worst offenders in this respect is the bur-marigold, more commonly known perhaps as “stick-tight,” the seeds of which are universally described as “beggar’s ticks.” We do not get a “square deal” from bur-marigold for it literally hands us its seeds by the hundred but we must pick them off one by one. It may be interesting to know that the generic name of these plants is “*Bidens*,” meaning two teeth, referring of course to the two teeth on the seeds that bite so tenaciously into our clothing.

Then there are the tick-trefoils, often known as “beggars-lice,” those small, pouch-like seeds that literally bury themselves in our garments. We know not where we get them,—they steal upon us unwares and they stay until plucked off individually, one by one.

Strawberries, blackberries, blueberries, checkerberries, etc. are eaten by birds and the seeds dropped in various

places; during migrations they may thus travel hundreds of miles.

Other seeds are thrown about by the bursting, curling or compression of the seed-pods. One is often startled when walking about the edges of ponds in autumn, by the sudden exploding of coiling pods of snap-dragon or touch-me-not as he brushes against them. The seeds are thrown about for a distance of several feet. The witch hazel pod gradually closes upon its elongated seeds until the pressure becomes so great that they are forcibly ejected, sometimes to a distance of thirty feet or more.

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